FOUNDRY TRADE JOURNAL

EST. 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

VOL. 105
No. 2177
Registered at the G.P.O. as a Newspaper

JULY 3, 1958
Offices: John Adam House, John Adam St., London, W.C.2

Single Copy, 1/-. By Post 1/4. Annual Subscription, Home 52/-, Abroad 60/- (Prepaid)

L 23 1958
ENGINEERING LIBRARY

AUTOMAT IRON

AUTOMAT REGD.
PIG IRON
for machinability with strength

EFINED IRON CO. (DARWEN) LIMITED
ING VALE WORKS · GRIMSHAW STREET · DARWEN · LANCS
Telephone: Darwen 1745|6|7 Telegrams: "Rolingot Darwen."
UTOMAT PIG IRON IS MADE IN ADDITION TO OUR NORMAL
GE OF REFINED MALLEABLE, CYLINDER AND HI CARB IRONS

This casting has a really good surface finish WHY?

Because M. W. Swinburne & Sons Ltd.—who cast it in brass and gunmetal—treated the moulds with a dressing of Foseco MOLDCOTE to ensure excellent surface finish.

All Foseco ' fired ' dressings contain Shell I.P.S. This is one reason why they achieve such consistently good results—this top-grade isopropyl alcohol is the ideal solvent for use in inflammable mould and core dressings.

Shell I.P.S. is also available (in two grades, I.P.S.1 and I.P.S.2) for the foundryman who prefers to make-up his own dressings. It ensures smooth even burning to give the best possible finish.

Ask for free literature on: Foseco MOLDCOTE—ready-to-use mould and core dressings; Leaflet M.2. Shell I.P.S.1 and I.P.S.2 for ' do-it-yourself ' dressings.

Foseco

SHELL

FOUNDRY SERVICES LIMITED · LONG ACRE · NECHELLS · BIRMINGHAM 7

Telephone: EAST 1911 (10 lines) Telegrams: ' KUPRIT, Telex, Birmingham '

Sole distributors of I.P.S.1 and I.P.S.2. to the Foundry Industry in the United Kingdom and Republic of Ireland for Shell Chemical Company Ltd.

FOUNDRY
TRADE JOURNAL

Vol. 105 July 3, 1958 No. 2177

Established 1902
Incorporating
IRON & STEEL TRADES JOURNAL

Single copy 1s.; *by post* 1s. 4d.
Annual subscription: home 52s., *abroad* 60s. (*prepaid*)

Editor:
V. C. FAULKNER, F.R.S.A., HON.M.I.B.F.

Assistant Editor: A. R. PARKES, M.I.B.F.
Commercial Editor: P. E. CARDEN

Advertising Manager:
F. BARRINGTON HOOPER, B.A.

Production Manager:
R. J. LOVELL

Publisher: H. J. DWYER
Circulation Manager: E. T. GRIFFITHS

District Representatives:
G. P. ELLIOTT (Northern Area)
T. H. SMITH (Scotland)

The FOUNDRY TRADE JOURNAL is the official organ of the British Steel Founders' Association; Association of Bronze & Brass Founders; Light Metal Founders Association; Foundry Trades' Equipment & Supplies Association; and the National Society of Master Patternmakers.

AN INDUSTRIAL NEWSPAPERS PUBLICATION

Published Every Thursday by Industrial Newspapers, Limited

BARRINGTON HOOPER, C.B.E.
Chairman and Joint Managing Director

F. BARRINGTON HOOPER, B.A.
Joint Managing Director and Commercial Director

F. R. LEWIS, JOHN HOOPER, D. HORN
Directors

E. G. WESTON,
Director and Secretary

JOHN ADAM HOUSE,
17-19, JOHN ADAM STREET,
ADELPHI, LONDON, W.C.2

Telephone: Trafalgar 6171 (Private Branch Exchange)
Telegraphic Address: "Zacatecas, Rand, London."

PRINCIPAL CONTENTS

Page

"Flocast" Process of Continuously Casting Cast-iron Bar

By H. E. Morris

This article, which is believed to be the first of its kind to appear in any journal, gives an account of the origin and development of the continuous casting process applied to cast-iron bar. The technique was, in part, developed in response to the requirements of machinists operating bar automatic lathes, but distinct improvements in dimensional accuracy and general quality characterize the product 5

Steel Castings for Heavy Machines

This abstract from a USSR technical journal describes recent developments in the Soviet heavy-machine industry, with special reference to methods of mechanized moulding and casting currently employed .. 15

Analogy between Carbon Deposits on Refractories and Spheroidal-graphite in Iron 19

Procédé "Flocast" de Coulée Continue de Barres en Fonte. Par H. F. Morris. Cet article qui parait être le premier de son genre à être publié dans aucun journal, décrit l'origine et le développement d'un procédé de coulée continue pour barres en fonte. Cette technique fut développée en partie pour répondre aux desirata des mécaniciens de tours automatiques pour barres. Ce procédé a pour résultat une véritable amélioration dans la précision des dimensions et dans la qualité générale du produit. 5

Prèces en Acier coulé pour la Construction de Machinerie Lourde. Cet extrait d'un journal technique soviétique décrit les développements qui ont pris place récemment dans l'industrie lourde soviétique: mention spéciale y est faite des méthodes de moulage et de coulage mécaniques en usage courant 15

"Flocast"-Verfahren zum Stranggiessen von gusseisernen Stangen. Von H. F. Morris. Dieser Artikel, der vermutlich der erste seiner Art ist, der je in einer Fachzeitschrift erschien, berichtet über den Ursprung und die Entwicklung des auf Gusseisen angewandten Stranggussverfahrens. Die Arbeitsweise wurde teilweise infolge der Erfordernisse der Maschinenbauer, welche Stangenautomaten verwenden, entwickelt, aber das Erzeugnis ist ausserdem durch eine Verbesserung der Massgenauigkeit und der allgemeinen Güte charakterisiert. 5

Stahlguss für den Grossmaschinenbau. Dieser einer russischen Fachzeitschrift entnommene Auszug beschreibt neuere Entwicklungen in der sowjetrussischen Schwermaschinenindustrie und erwähnt besonders die derzeit angewandten Methoden für mechanisiertes Formen und Giessen 15

Features, News, Commercial Information, and Statistics

Leader: Farmer and Founder 1
Featuring: Mr. Eric J. Leaver 3
Correspondence: "Keeping up with the Jones's" 4
ABBF Area Meeting 4
Steel Centenary 14
British Non-Ferrous Metals Research Association 14
Foundry Employment in Scotland 20
Shaw Process in Europe 20
Company News 21
Contracts Open 21
News in Brief 22
Personal 24
Raw Material Markets 28
Current Prices of Iron, Steel and Non-ferrous Metals 30

August's LIMITED bring new efficiency to FOUNDRY PRACTICE

★ In new and highly competitive conditions, time-saving, labour-saving, cost-saving methods have become imperative. August's, pioneers of foundry mechanisation are today rendering the finest contribution to the industry and to British Engineering.

Photograph shows: The compact design of the Sand Preparation Section in a typical 'August's' mechanised unit. Note the large reclaimed sand storage hopper, bucket loader, mixer (and dust hood) with discharge direct to distributing conveyor.

Sole Licensees and Manufacturers for the British Empire (excluding Canada, Australia and New Zealand) of the Simpson Sand Mixer.

AUGUST'S LIMITED · HALIFAX · ENGLAND

Telephone : HALIFAX 61245/6/7/8 Telegrams : AUGUST, HALIFAX

J.J.M.

FOUNDRY
TRADE JOURNAL

Vol. 105 JULY 3, 1958 No. 2177

Farmer and Founder

A very pleasant day was spent at Winchester where we examined the rather obscure relationship of an agricultural exhibition to the foundry industry. In the old days, a foundry would show a newly-patented cast-iron pig trough, plough points, a few simple pumps, and so forth. Nowadays, there is an imposing machinery section, but at Winchester, we found this to be ill-assorted, because with the exception of about half-a-dozen stands, the majority were operated by local dealers. Thus, one found one make of tractor shown on three stands, whilst other well-known makes were absent. This show at least was a free-for-all, and included tailors and a jeweller, with one stand showing reconditioned machinery—a line which is barred from most exhibitions.

All this raises the question, whether a show, capable of attracting 16,000 people on the first day, is one at which foundry concerns should show domestic-heating appliances, and lawn mowers—a maker of the latter had taken space—or should be represented directly or through agents. We are aware that some large foundries have in the past taken space at a number of local shows, and then abandoned the idea. Judging from the expensive cars crowding the parking places, the farming community has a very high buying capacity, and, moreover, represents Britain's largest industry. It is a very efficient industry, and its degree of mechanization, and production per acre, ranks almost the best in the world. Whether they rely on the agricultural shows to keep them abreast of the times, or whether it is preferable to get their impressions from their visits to the market towns is questionable. The best advice we can give to foundries serving agriculture is to give maximum support—especially technical—to their local distributing agents.

For a foundry executive to visit one of these great shows, provides not only a complete relaxation from work, but gives him much background information for future planning. As the Gas Board, the Electricity Authority, the oil-distributing concerns, and those devoted to developing the sales of Calor gas all have huge stands, he will be able to assess the relative potential demand for appliances using these various sources of power and heat. Agricultural shows provide a rough-and-ready study of at least the local market.

ERIC J. LEAVER

Featuring . . . .

MR. ERIC J. LEAVER

MR. ERIC J. LEAVER, the manager for Carron Company, Falkirk, comes of a Somersetshire family but was born in Yorkshire to his lasting satisfaction. Starting his industrial life with W. Whitwill & Company, Limited, a firm (now defunct) making pig-iron and wrought-iron products, of Thornaby-on-Tees, his work and training was on the commercial side of the business but his interests extended very much to the practical side of ironmaking. When still a young man he joined the Frodingham Iron and Steel Company, Limited, of Scunthorpe, in their works accounting department, and in 1935 went to Stewarts and Lloyds, Limited, Birmingham. Here he became assistant to the chief cost accountant, extending his experience in the financial and organizational problems of a modern iron and steel works.

It was not until 1942 that Mr. Leaver came to Scotland, the country of his adoption. As cost accountant to Carron Company, Mr. Leaver had a formidable task completely to reorganize the works records and the costing and accounting systems. His interest in, and knowledge of, the practical side of works administration soon resulted in the scope of his duties being extended, and after being promoted to the post of chief accountant he was appointed assistant manager. In May, 1954, he became *manager* for Carron Company. This is equivalent to the managing director of a limited liability company, and has been the official title of the man who manages and directs the affairs of the company since it was formed in 1759. Among other unique features, Carron Company is the only manufacturing company which is a partnership operating under a Royal Charter. Mr. Leaver is a director of the South African company with which Carron is associated, and this necessitates an annual visit to Johannesburg. Carron Company have extensive properties on the River Thames, and Mr. Leaver, as a director of their wharfing company, Carron & Continental Wharves, Limited, takes an active interest in this side of the business.

The wide interests of the historic company to which he belongs, and its very extensive range of manufactures, make the job of overall control a particularly onerous one, leaving little time for other interests. Mr. Leaver, however, adds to his activities directly concerned with the company's affairs, committee work which he judges as the necessary minimum. This includes membership of the executive committee of the National Light Castings Ironfounders' Federation and of the British Ironfounders' Association. He is also a director of the British Bath Makers' Association, Limited, and a director of the Forth Valley Chamber of Commerce. Mr. Leaver is a firm believer in the necessity for relaxation if the mind and body are to be kept fresh and vigorous, and such spare time as is available he devotes to the pictorial arts, particularly landscape painting in oils, and sailing his little dinghy on Carron Dams—a lovely stretch of water lying between the manager's residence and the ironworks.

Correspondence

KEEPING UP WITH THE JONES'S

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—I read with great interest your leading article of June 5, under the above title. The sting, from my point of view, was in the tail and it is upon your last sentence that I would like to make one or two observations. This sentence read: "The foundry industry needs to take steps to acquire prestige with the general public equal to that enjoyed by the chemical and iron and steel industries—it certainly merits it."

Now it would, of course, be an impertinence on my part to attempt to speak for branches of the industry other than ironfounding. I contend, however, that so far as the ironfounding industry, represented by the Council of Ironfoundry Associations, is concerned, steps have been taken, are being taken and will be taken to acquire that prestige to which you refer.

We come here to a difficult point of definition. Perhaps when, in this context, we refer to the "general public" you and I have different sectors of the nation in mind. The general public which is constantly in my thoughts consists, in the first place, of all those varied industrial sections which buy, or ought to buy, iron castings and, secondly, those other sections which, in the political, economic or technical fields, have some influence upon the ironfounder's customer and user. Quite frankly, the vast mass of the general public in the normal understanding of the term is of comparatively lesser importance in my judgment.

If, therefore, you take the general public as I have defined it, I think that, for a number of years past, the ironfounders can claim to have done their full share to acquire and maintain prestige for their industry through this Council.

From the foundation of the CFA in 1941, the use of all the available channels of publicity has never been entirely neglected, and since 1952 this work has been greatly intensified. For example, in the publication "Years of Endeavour" a successful attempt was made to remove many misconceptions about the attitude of ironfounders to the health and safety of ironfoundry workpeople. In addition, during the period since 1952, there has been a steady output of widely-circulated reports and publications all tending to impress the outside world—the world, largely, of the user of castings—with the enduring importance of the iron casting and with a clear idea of its merits. Liaison is closer, and the credit of the industry is higher, with the Press and, in a lesser degree (because entertainment plays so large a part here), with broadcasting media, than it was.

So far as this Council is concerned, therefore, the ironfounding industry can have a clear conscience and I would readily supply you with much fuller details, were I not aware that the FOUNDRY TRADE JOURNAL is well acquainted with them as, I am grateful to note, your own columns so frequently reveal. Yours, etc.,

B. H. TRIPP.
Public Relations Officer.

Council of Ironfoundry Associations,
14, Pall Mall,
London, S.W.1.
June 25, 1958.

[Foundry centres apart, the man-in-the-street—ranging from stockbrokers to chauffeurs—still thinks the foundry is a branch of the iron and steel industry—EDITOR.]

OWING to the increase in activities, Metallurgical Engineers, Limited, have moved to larger premises and the address of the company is now 5-15, Cromer Street, London, W.C.1. (Telephone: TERminus 8689).

ABBF London-area Notes

At the meeting of members of the Association of Bronze and Brass Founders in the London area, held at the Clarendon Restaurant, on June 11, Mr. Frank Hudson suggested that casting quality should be the subject for a campaign by the Association in order to provide the designer and engineer with castings possessing better, and known, physical properties. Too much emphasis, he said, had been placed on test-bars, whilst there was a singular lack of attention to the properties of castings. The purpose underlying the campaign should be that engineers would be able to obtain from bronze and brass founders, castings which were 100 per cent. sound, and whilst this might seem to involve insuperable difficulties, such castings would have to be produced, in view of the increased use of other materials which could eventually put the bronze and brass foundry industry out of business. The idea was agreed by members to be a sound one, and it was unanimously decided to pursue the matter further, first by including it on the agenda for the next Council meeting, to be held in July, with the possibility of commencing a series of meetings which could include: discussion of the improvement of and design of castings, amelioration of physical properties, what was the most suitable material to use for any particular job, and the education of the buyer to avoid the pitfall of merely buying on price per lb. In connection with the latter subject, it was said that to overcome purely price competition, members should sell guaranteed castings, and if work was undertaken to determine the strength of sections, this, together with good design, could reduce the weight of castings and so help to reduce costs.

It was thought that these meetings—particularly the first one—should be made open to buyers and designers, as well as members of the Association, so that all sides of the question could be discussed. It was hoped that the first meeting would be held in January.

Previous to this contribution to the proceedings, a report had been given on the progress of matters affecting bronze and brass founders which included: The Clean Air Act; the Thermal Insulation Act; European Committee of Foundry Associations; safety health and welfare in non-ferrous foundries; the technical advisory and research group; BS. 1400 revision; and liaison with other associations.

With regard to the future programme for London-area members, it was stated it was hoped that at the next meeting, to be held in September, the subject would be "Surface Finish of Castings;" in December it would be "Costing a Casting."

The meeting continued with the showing of three films, produced for the Italian foundry industry by OEEC, entitled "New Ideas at Work in the Foundry;" "Hand and Machine Moulding;" and "After the Shake-out." Another film in the series, dealing with design of castings and patternmaking, has a bearing on Mr. Hudson's suggestion, and it was decided to show this at the January meeting.

DAVY & UNITED ENGINEERING COMPANY, LIMITED, Sheffield, have received an order worth over £1,000,000 from the Northern Aluminium Company, Limited, for a breaking-down and plate-finishing mill plant for their Rogerstone works. The mill is part of a scheme costing £10,000,000 to increase the capacity of the works of aluminium sheet and strip from 50,000 tons to 75,000 tons a year. Spear & Jackson, Limited, Sheffield, are providing six carbide-tipped circular saws for the Rogerstone works. The saws, 50-in. across, are for use in a sawing machine costing £30,000, which can cut non-ferrous plate up to 57-ft. long, 10-ft. wide, and 6-in. thick.

"Flocast" Method of Continuously Casting Iron Bar

By H. E. Morris

Mr. Morris is at present works metallurgist at Harold Andrews Sheepbridge, Limited, Halesowen, Birmingham. He was educated at the Chance Technical College, Smethwick, and subsequently held the position of senior chemist at Morris Commercial Cars, Limited, Birmingham, and later of Metallurgist at Duport Foundries, Limited, Tipton. He is an associate member of the Institute of British Foundrymen.

The development of a commercially acceptable method of continuously casting iron bar represents a highly significant advance in the production of this material. Whilst a technique for use in the field of non-ferrous metals has been in operation for some years, the application of the same principle to steel and cast iron presented many formidable difficulties. The manner in which these were overcome and the process which eventually came into being are described at some length in what follows. In view of the several known advantages of continuous cast bar—such as increased dimensional accuracy, greater usefulness in bar automatics and general quality—the ensuing account of the "Flocast" process, which is, it is believed, the first of its kind published in any journal, will be of very considerable interest to foundrymen everywhere.

Cast-iron bar has long been made in sand moulds, but although its production might appear to present few problems, in practice it is comparatively difficult to obtain bars free from defects. Among these the most disconcerting is porosity and warping, the latter being particularly troublesome where reasonable lengths of small diameter are required. Harold Andrews Sheepbridge, Limited (then known as Harold Andrews Grinding Company, Limited) were fully appreciative of the need for (1) producing a cast-iron bar which already being cast to fairly close limits, could be finished to size with the minimum of machining, and (2) providing a length of bar up to 6 ft., of ¼ in. to 3 in. dia., being centreless ground to size, and capable of being used in bar automatics and multi-tool lathes, which would provide the engineering industry with a product allowing mass-production of articles (*i.e.* bushes, collets, pulley wheels, rollers, bearings, etc.) without the use of individually sand-cast parts.

Bearing the above in mind, the possibility of casting bars in metal dies was investigated, but even so, although success which was forthcoming in the form of a much improved bar, difficulty was still experienced in obtaining one entirely free from porosity and piping, and then it was only possible to produce bars in lengths up to 30 to 40 in. It could be foreseen that there was still a need for a much longer bar of even higher physical qualities, and a semi-continuous casting technique was envisaged, bearing in mind, however, that for some considerable time work along these lines, in experimental form, had been carried out in the USA, and on the Continent with very little success.

The continuous casting of non-ferrous metals has been carried out for a number of years but the application of the method to steel and cast iron presented many difficulties, not the least of which was the high melting point involved and the necessity and difficulty of keeping the metal molten for a long period of time. In 1857, Bessemer suggested a method of continuously casting steel strip by pouring molten steel between two water-cooled rolls. His process, however, never seems to have been developed commercially.

A number of attempts have been made to cast steel into billet moulds mounted on to a continuous chain so that each mould was filled as it passed directly in front of a pouring hole in the front of the furnace, the billet being ejected at the end of its run, but again little or no progress appears to have been made in this direction. It seemed obvious that the only success was going to be achieved from the pouring of the molten metal into a suitable cooled-die orifice along the same lines as that used in continuously casting aluminium and other non-ferrous metals.

Experiments were first begun along these lines in 1943, and much work was done before bar was successfully pulled in 1946. This was the result of building a machine which pulled a bar horizontally from a die located at the base of a heated crucible, and the result was something like 20 to 30 ft. of 2¼-in. dia. bar. Even at this stage very many problems presented themselves. It was felt that a machine erected vertically would have many advantages over the horizontal type, and a vertical pulling machine was subsequently erected early in 1947.

The greatest setback was experienced late in 1947, when the pioneer of this project, Mr. W. Williams, who had been ill for some time, died, and the scheme was shelved for a time. It was eventually restarted a year or so later, and became a commercial proposition in 1951, when bar of 2¾- to 3-in. dia. was successfully pulled for use and subsequent sale.

The set-up of the plant for pulling bar consists of six pieces of equipment:—(*a*) a small cupolette

FIG. 1.—*Equipment utilized for the set-up of plant for pulling bar*—(a) *small cupolette for melting.*

for melting (Fig. 1); (*b*) a pre-heat furnace to maintain metal temperature (Fig. 2); (*c*) the die in which the bar is formed; (*d*) the pulling mechanism (Fig. 3); (*e*) the cut-off and bar-removal mechanism (Fig. 4), and (*f*) the electronic timing panel (Fig. 5).

Manufacturing Details

The cupolette is a 27 in. dia. shell bricked down to give a melting rate of between ½ and 1 ton per hr. which is capable of serving three machines, providing that the sum of the diameters of bar being pulled at any given time does not exceed 6 in., *i.e.* 2¾ in., 2 in. and 1¼ in. dia., the cupolette being on the same level as the pre-heat furnace.

The metal is carried by a hand shank from the cupolette to the pre-heating furnace, which is of the oil-fired type, having a 100 lb. "Salamander" crucible located at its centre and bridged over with ganister to conserve heat in the crucible, at the bottom of which is the die surrounded by a copper water-jacket. There are two sets of alignment rolls situated just below the die to prevent lateral movement of the bar as it emerges from the die and a pair of withdrawal jaws are positioned below these alignment rolls. These are actuated by a rod connected eccentrically to a flywheel which is arranged in such a way as to allow the rod to be moved in a slide on the flywheel, thereby increasing or decreasing the amount of withdrawal, and below this are a pair of holding jaws so arranged to allow free movement of the bar through them whilst being withdrawn, but clamping on the bar at the finish of each withdrawal to prevent it dropping out of the die from gravitational force.

A horizontally-acting carborundum wheel termed a "Radiac" can then cut off the bar into 6-ft. lengths which drop into a bucket mechanism so balanced to swing from the vertical to just below horizontal position and eject the bar on to a specially-designed pallet, from which position it can be removed to be machined and ultimately stored. Whilst the "Radiac" is operated by a foot lever, the rest of the mechanism, being fully automatic, is controlled from an electronically-operated control panel, with provision for manual operation should any of the electronic equipment fail.

Routine Production

To prepare for a day's run, a "starter" bar has to be inserted into the die in perfect alignment with it, and as the full height of the machine from the pre-heat furnace to the holding jaws is 12 ft., three bars are screwed together to make one long bar, primarily for ease of setting up. Metal is tapped from the cupolette into a hand shank and poured into the crucible in the pre-heat furnace, temperature being controlled within fairly close limits whereupon it "dogs" itself on to the starter bar. After a predetermined interval, depending upon the size of bar being pulled, the timing mechanism comes into action and pulling is commenced, and as it is an intermittent pull, the interval will vary directly with the diameter of the bar (see Fig. 6).

The starter bars are unscrewed one by one as they clear the holding jaws, and the first 3 ft. of bar are cut off and scrapped because of the high chill prevailing at the commencement of a run, this persisting until the temperature of the die has risen to normal working conditions.

FIG. 2.—*Equipment utilized for set-up of plant for pulling bar*—(b) *a pre-heat furnace to maintain metal temperature.*

FIGS. 3 AND 4.—*Equipment for pulling bar*—(c) *the pulling mechanism.* (d) *cut-off and bar-removal mechanism.*

The length of each pull is based on three factors, the length of the die, the volume of water flowing through the die-surround jacket, and the interval between each successive pull, these bearing somewhat of a mathematical relationship to each other but being based primarily on experience derived from long and continued experimentation.

To determine the length of die and the speed of withdrawal, the following mathematical functions have to be considered:—

T_1-T_2 = The solidification range of cast iron, this being a variant according to the type of iron being used i.e.,

T_1 = 1,400 deg. C. approximately for high-chromium irons.
1,150 deg. approximately for low-phosphoric irons.

T_2 = 1,100 deg. C. approximately for low-phosphoric irons.
950 deg. C. approximately for high-phosphoric irons.

t = The time in seconds to cool from T_1-T_2.

θ = The mean rate of solidification $= \frac{T_1-T_2}{t}$.
The average value for cast iron being approximately 5 deg. C. per sec.

α = The temperature gradient along the die length in deg. C. per in.

l = The minimum length of die in in. necessary to cool from T_1-T_2.

S = The speed of bar withdrawal in in. per sec.

$$\text{Then } \alpha = \frac{T_1-T_2}{l}$$

$$S = \frac{\theta}{\alpha}$$

$$l = \frac{S\,(T_1-T_2)}{\theta} = St.$$

It also should be borne in mind that the heat conductivity of the die material as assembled is approximately three times that of cast iron.

Any extra length of die over and above that calculated from the preceding formulae will be used in further cooling and in helping to keep the issuing bar in more perfect alignment until it is sufficiently cool to prevent further unnecessary warping from taking place.

It will be obvious that the volume of water passing through the surround jacket is inversely related to the temperature of the effluent, which under normal conditions is maintained at approximately 27 to 29 deg. C. A large dial-type thermometer is used to record this, and placed in such a position on the machine for the operator to see it easily. The greatest limiting factor of heat extraction is

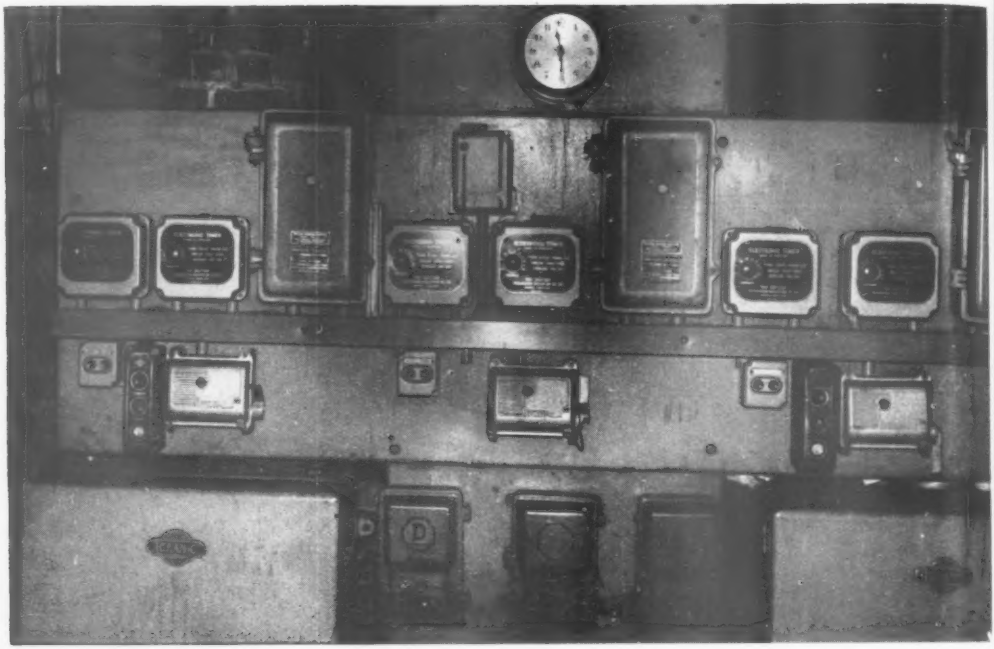


FIG. 5.—*Equipment for pulling bar.* (c) *electronic timing panel.*

the heat transfer between the bar and the die wall. This remains high while the metal is in the liquid state and has proper and constant contact with the die wall, but the immediate effect of rapid heat-transference and subsequent cooling is the formation of a solid shell around the bar, which, upon further cooling, produces a contraction thus forming an air gap between the bar and the die. This results in considerable interference with the heat extraction at the very moment when the increasing thickness of the solid metal shell between the freezing zone and the outer surface of the bar would call for more intensive cooling.

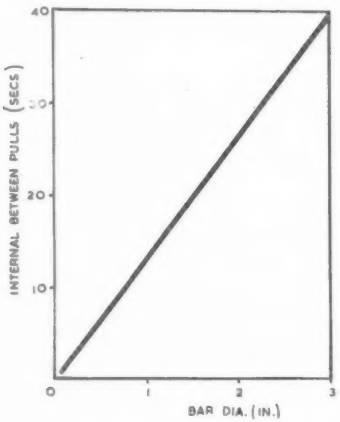


FIG. 6.—*Graph showing relationship of the interval between pulls to the diameter of bar being pulled.*

Difficulties Encountered

At the same time, in practice it has been found that although the hot strength in this area is very low and could bring about a subsequent fracture possibly causing the bar to break, it nevertheless has the advantage that, cooling taking place more slowly and more uniformly, a partial annealing of the skin occurs thereby obviating any incidence of chill. The fracture of the bar in the die can give rise to two difficulties, either the bar simply breaks (which invariably occurs with small diameters), or the molten metal flushes through the bottom of the die, the consequences of which need not be enumerated here.

The mechanics taking place in the die to cause "flush through" are believed to be as follows.

(*a*) The shell which is first formed tends to adhere to the die wall and the next pull fractures it, leaving a gap (Fig. 7 (*a*)).

(*b*) This gap is immediately filled with molten metal causing a weak area, and on the next pull it fractures again, this time lower down the die (*c*). Finally, the third time of fracturing is at the very

base of the die which ultimately causes the metal to flush completely through, so draining the preheat crucible of molten metal (Fig. 7 (*c*)).

Junghans in Germany was the first to try to overcome the problem of fracture and ultimate "flush through," by using a reciprocating-mould technique, which was further developed by Rossi in America. This involved the mould moving vertically downwards for about 1 in. at the same speed as the bar, and at the end of its downward traverse it moved rapidly back to its original position at about three times the speed of the bar withdrawal, so that in the downward stroke, there was no relative movement between the mould and the bar, but on its return stroke the mould moved with a velocity of four times that of the bar-withdrawal velocity.

Of more recent date, a patent has been taken out by a Swiss firm, for a technique whereby, using the same system of the reciprocating mould the return stroke of the mould is only twice the velocity of the withdrawal velocity of the bar, still giving the same results. The same effect is produced by semi-continuous or intermittent pulling as in the "Flocast" process, and this, together with closer chemical and temperature control, has overcome the incidence of "flushing through."

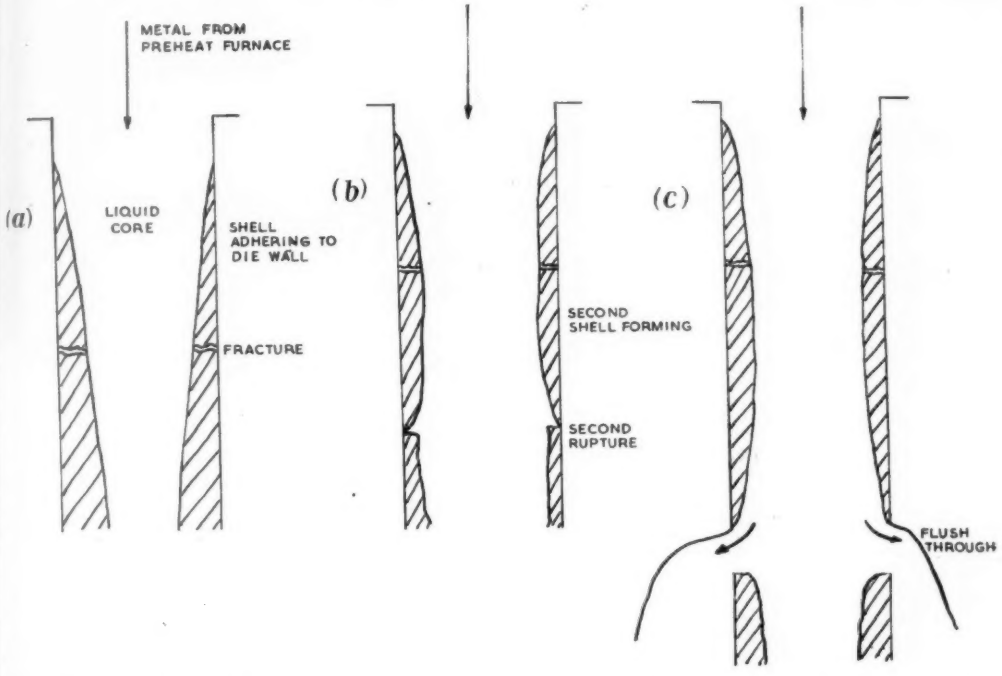


FIG. 7.—*Mechanics of "flush-through"*—(a) *shell adheres to die wall and the next pull causes fracture to occur* (b) *the gap resulting from this is filled with molten metal, creating a weak area and a second fracture* (c) *third fracture occurs at the base of the die, causing metal to flush completely through.*

Hot-spotting

Another difficulty encountered in the production of small-diameter bar is that of cyclic hot-spotting, which again appears to be a direct cause of the bar breaking. As will be appreciated, with intermittent pulling of bar, a "lap" or joint occurs at the point of liquidus/solidus phase in the die, and in nearly every case where fracture has resulted it takes place at half to one inch below the "lap." Very often this occurs just below the first definite lap on the bar, that is about 8 in. from the top of the die, but sometimes it is one or even two pulls lower. Preferred location for the fracture is quite definite evidence of cyclic hot-spotting. This was confirmed by examination of a piece of bar showing surface sinks in the "fracture position," and for local sinks to occur, eccentric cooling is required. Such would result from the bar dragging on the one side of the die because of alignment trouble.

Hot zones can be seen on the outside of the bar as it emerges from the die, and are most obvious on small sizes. Fig. 8 illustrates the possible mechanism of hot-spot formation. For this to be valid, the rate of heat extraction at B has to be greater than at A so that the liquid core formed is less than the length of one pull. The rate of heat

extraction just below B must be less than just above B so that the iron in the hot spot below B tends to remain liquid, whilst the iron above B tends to solidify. This is possible because of the air gap formed below B, whereas the metal above B is still in contact with the die.

This theory cannot be strictly accurate since one would expect to find shrinkage and structural differences in the hot zone which have not been in evidence, and yet it is possible that the shrinkage is being taken up externally. Conditions in favour of hot spotting therefore are:—(1) A shallow liquid core; (2) a long withdrawal stroke, and (3) a long solidification period between successive pulls.

It is probable that part of the difficulty experienced with small diameters may be caused by the ratio liquid-core : pull decreasing and intensifying the hot spot, and the decrease in the ratio cross-section : surface-area acting so as to increase wall friction relative to bar cross section (and, therefore, strength) as the diameter decreases. The bar usually behaves most erratically inasmuch as it runs alternately hot and cold over cycles of 8 to 12 in., as it leaves the die.

Variations in size and structure occur which suggest that the position of initial break, and thus the sizing zone (the die is tapered slightly), can spasmodically jump from one position to another under certain critical conditions and yet still continue to pull successfully. Presumably this requires both a long liquid core (projecting below B in Fig. 8) and a pronounced hot-spot. The "triggering" of the jumps is probably due to sudden changes in temperature of metal entering at the die top.

Obviating Breaks

Considering Fig. 9 (*a*) it is proposed that under normal conditions the break occurs every time at B, solidification of the main shell taking place over B-C. If for any reason (*i.e.*, surface friction and redistribution of stresses during pulling) fracture takes place at position (2), and channel (F) is not open to (E), then a normal type of failure will result. Given a sudden increase in the temperature of liquid metal reaching (E) so as to open the channel (F-E), and a shift of the break from (1) to (2), the process can continue at a lower level, but why this jump occurs instead of a gradual drift of position (1) to a lower level is not at all clear. It may be that it is due to the intensity of the hot spot at (F), and the nature of the frictional forces developed over (B-C).

Fig. 9 (*b*) shows diagrammatically the macro-structure of such a piece of bar. The ferrite-rich areas at the outside are thought to be indicative of regions that have solidified more quickly than the essentially pearlite zones.

Under normal conditions, the structure consists of a cyclic repetition of zone (A-B), but in this case it is thought that zones (C-D) and (D-E) solidified one position lower than normal C-D, Fig. 9 (*a*) break at position 2), the heat from the liquid metal passing through (B-C) causing this zone to solidify somewhat more slowly, giving the thin ferrite shell, and causing the next break to jump back to position (1).

As will be seen from Fig. 7, there is a liquid core present in the bar which can extend to a point below the bottom of the die, and so it is important to know the depth of this core in order that the cut-off point of the bar can be predetermined, to ensure that this point is well below the liquid core and at a point of complete solidity.

To enable this point to be determined the following approximate values can be taken. Although this applies more particularly to steel and some of the values are assumptions, they nevertheless give a workable basis for cast iron.

$$H = \frac{VD^2}{4}$$

Where

H=The length of the liquid core (in.).
V=The velocity of bar withdrawal (in. per min.).
D=Diameter of bar (in.).

E.g., a bar of 1-in. dia. at a withdrawal velocity of 20 in. per min., the height of liquid core would be in the order of 5 in. and hence would not penetrate below the lower end of the die.

Die Finish

It is most important that the die material shall be entirely free from blemishes and hairline cracks or fissures on the die face, otherwise metal penetration results with subsequent rapid cooling and high frictional stresses are set up which, in the case of a small-diameter bar, will cause it to break when the withdrawal load is applied and in the case of larger-diameter bars give a very rough lined surface instead of the smooth finish required.

The power unit to effect withdrawal is a 10 h.p. motor fitted with a suitable gear-box reduction drive connected to the flywheel, which in turn, *via* the connecting rod, actuates the withdrawal jaws. The action of this motor is governed by an electronic timing device, which allows the withdrawal jaws to move to their pulling position after each pull and to prevent over-riding of the flywheel.

Naturally, the benefits accruing from the production of bar in this particular way require to be carefully assessed and everything seems to be in the metallurgist's favour. Since the bar is being fed by a head of between 50 to 100 lb. of molten metal, from the foundryman's point of view this presents the most perfect "feeding" and "gating" system which could possibly be wished for, and hence internal shrinkage and porosity are unknown. It has already been mentioned that, with correct alignment in the withdrawal jaws and the careful placing of the alignment rolls, warping is kept to a minimum.

Occasionally blowholes are in evidence in the first few feet of bar pulled, and are a result of the molten metal first striking the die assembly and during the time necessary to bring the die to a working temperature, which is usually only a few minutes.

Dross and any foreign inclusions which enter into the pre-heat crucible rise to the surface and are periodically removed with a rabbling iron.

Structure

Across the diameter of the bar the grain is very close, and is fairly consistently so, except for a small core at the centre of the bar where the grain size increases slightly. Typed on the American Society for Testing Materials' scale, the graphite generally is D8, E8, with ovoid patches of D5 at the centre of the bar, corresponding with the last position to solidify. As would be expected, the structure at the o.d. is extremely fine graphite in a very dendritic matrix consisting of 90 per cent. free ferrite, the remainder being extremely fine pearlite, but at the centre of the bar the free ferrite falls to just under 50 per cent., the remainder there being fine pearlite. Components made from "Flocast" bar are not scrapped after costly machining as a result of any of the foregoing flaws becoming evident, as is so often the case when sand casting has to be resorted to in the production of the original castings.

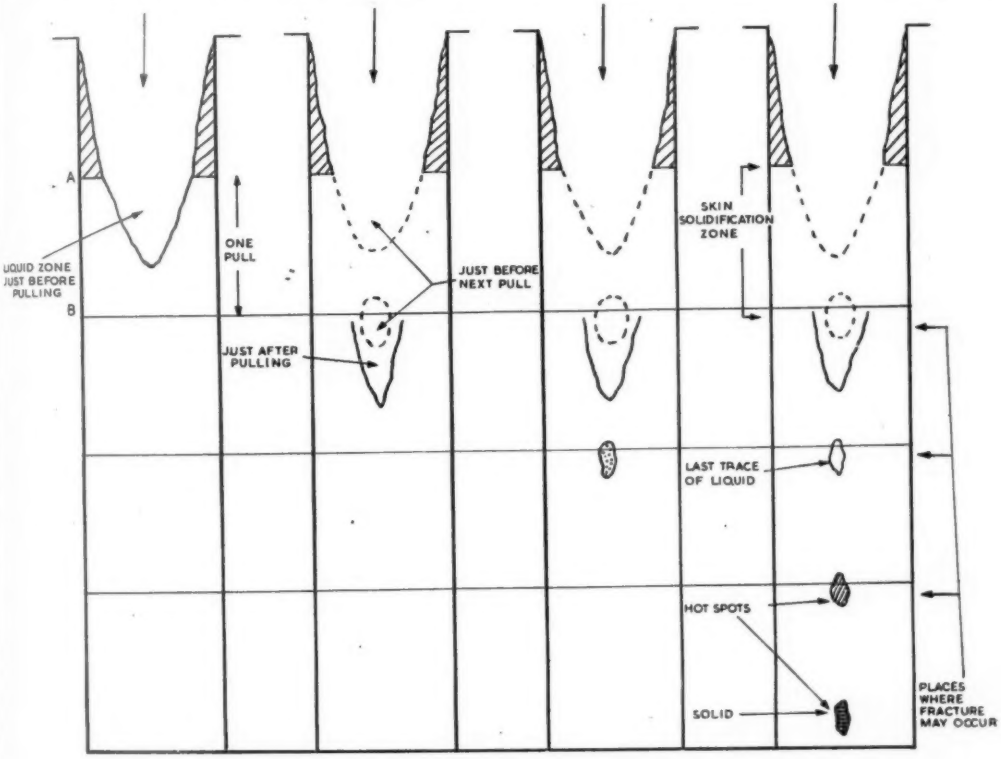


FIG. 8.—*Schematic illustration of the possible mechanism of hot-spot formation.*

Influence of Chemical Composition

Naturally the chemical composition of the iron plays quite an important part in the successful pulling of bar and to some extent in the finish of the bar as cast, and the following composition is strictly adhered to:—Total carbon, 3.20 to 3.40 per cent.; silicon, 2.70 to 2.90 per cent.; manganese, 0.60 to 0.80 per cent.; phosphorus, 0.40 to 0.60 per cent. The most important role is that of the phosphorus and to a lesser degree the manganese and the total carbon.

Phosphorus

Considering these three elements in the order given it has been found imperative to control the phosphorus between the limits of 0.4 to 0.6 per cent., otherwise difficulties do arise. Since the phosphorus plays such a large part in the solidification rate and sequence of the iron, it is found that, if it falls below these limits the tendency is for the bar to solidify higher in the die. On occasions it has actually been found to solidify at the junction of the die top and the base of the pre-heat crucible. Whilst in the initial stages of pulling it does not affect the bar, it is noted that after pulling for some time, the top of the die in immediate contact with the molten iron in the crucible erodes in the bore and becomes funnel shaped, and if the

Continuously Casting Iron Bar

low-phosphorus bar ultimately forms in the funnel it invariably breaks.

The question might naturally be asked, if that is the case, why not increase the speed of pulling or decrease the flow of water through the surround jacket?

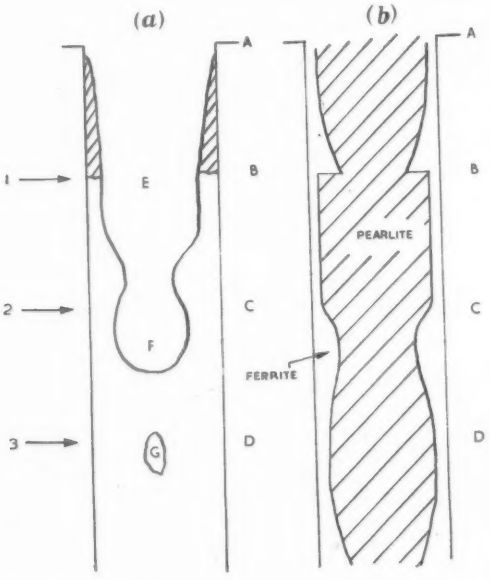


FIG. 9.—(a) *Schematic illustration showing points at which initial break in bar is liable to occur and* (b) *macro-structure of such a bar showing ferrite and pearlite areas.*

if the interval between pulls is 2 sec., then the bar has to be cut off in under 2 sec., and before the bar begins to descend again. Hence the lowest limit of phosphorus content appears to be 0.40 per cent., this being again as a result of long experience in "Flocast" experimenting.

Returning to the upper limit of 0.60 per cent. phosphorus, any increase over and above this figure results in the formation of phosphide sweating at the "laps," and if the phosphorus content exceeds to any notable degree the top limit the phosphide beads are very large, and will cause endless trouble in the final machining operation. It is, therefore, much more simple to control the phosphorus content between these limits (which incidentally works very well for all bar diameters) than to alter several other variables.

TABLE 1.—*Effect of Increasing the Silicon Content at Half-hourly Stages.*

Per cent. Si.	ult shown.
2.76	
2.55	
2.32	g occurred.
2.45	g ceased.
2.65	
2.80	
3.00	
3.20	

Manganese

If the manganese content rises above 0.8 per cent. the effect is to give the iron much more fluidity, and this, although it appears to make little or no difference to pouring technique or solidification in ordinary foundry practice, in continuous casting again causes the bar to set much lower in the die and results in frequent "flush-through." It was found that increasing the manganese content to 1.0 per cent. or higher, the metal could be made to flush through at will.

Total Carbon

The total carbon does not appear to have any marked effect upon the pulling of bar except that, in the case of small-diameter bar, there is less likelihood of the bar fracturing if the total carbon is in the order of 3.18 to 3.25 per cent., this being accounted for by the fact that the carbon equivalent is lower and hence the bar has a greater hot-strength.

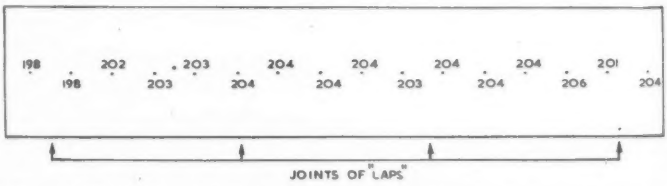


FIG. 10.—*Results of Brinell hardness tests taken along a 12-in. length of 2½-in. diameter bar.*

Whilst the water flow does affect the solidification front in the die, it is not capable of lowering the solidification position to the extent of one pull, *i.e.* 3½ in., which is really what is required. An increase in withdrawal rate will overcome this and cause the bar to set lower in the die, but it must be remembered that, in the case of small-diameter bars, the timing mechanism is already operating very close to its lowest limit and so little or no increase of withdrawal velocity is available, but even if it were, the cut-off mechanism being stationary in relation to the downward traverse of the bar, the bar could only be cut off in the period between successive pulls. Thus, taking an arbitrary example,

Silicon

Silicon has been varied between 2.4 and 3.2 per cent. without any trouble occurring, although in the region of 2.4 per cent. there is a tendency for the bar to "bind" the reasons for which presumably are the same as those given for a low-phosphorus iron. The silicon was varied at 30-min. intervals as in Table 1.

To obtain the composition previously quoted, the following charge is used with additions of ferro-silicon and ferro-manganese as required:—33 per cent. returned scrap; 26 per cent. hematite pig-iron; 15 per cent. No. 3 foundry pig-iron and 26 per cent. refined pig-iron. By substituting some of the refined iron by a 3 per cent. chromium refined pig-iron and inoculating the shank with nickel "F" shot, a heat-treatable bar is produced usually which has a higher tensile strength as cast, and which follows the previous composition plus 0.5 per cent. chromium and 1.5 to 1.8 nickel.

TABLE 2.—*Properties of Continuously-cast Bars.*

Dia. of bar.	Ultimate Tensile stress, tons per sq. in.	Shear stress, tons per sq. in.	Compression, tons per sq. in.	
			Edge.	Centre,
(In.)				
1	14.6	15.2		
	15.0			
	14.8			
2½	10.0	12.0	52.1	39.6
			55.6	44.8
			56.4	44.1

At the present time, an extensive programme of physical testing is being undertaken on all sizes of bar, but naturally much work is required to produce test-pieces for each size, and so figures available are by no means comprehensive. Table 2 shows available figures for 1 in. and 2½ in. bar which shows the superiority which "Flocast" bar has over its sand-cast counterpart for normal grey-iron of equivalent chemical composition.

To satisfy a user's requirements a series of high temperature tensile tests were carried out both on "Standard" bar and "H.2" bar (*i.e.* nickel-chrome) of 1¼ in. dia., the results being shown in Table 3.

TABLE 3.—*Elevated-temperature Tests on Standard Ni/Cr Bars.*

Sample No.	G.L. dia., in.	Temperature, deg. C.	Breaking load, tons.	Ultimate tensile stress, tons per sq. in.
Standard ..	0.798	Room temp.	6.10	12.2
	0.798	200	5.77	11.5
	0.798	300	5.00	10.0
	0.798	400	4.75	9.5
	0.798	500	4.80	9.6
H.2	0.798	Room temp.	6.10	12.2
	0.798	200	5.78	11.6
	0.798	300	5.85	11.7
	0.798	400	6.00	12.0
	0.798	500	5.45	10.9

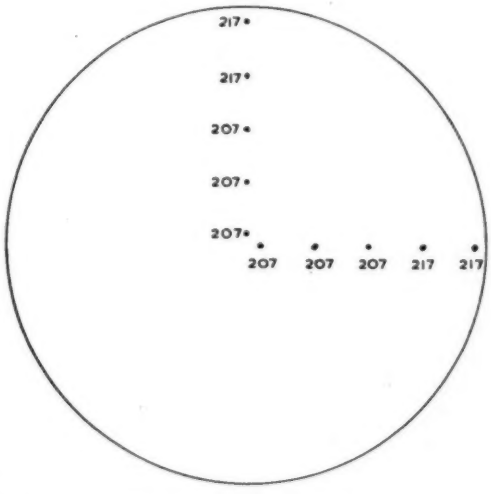
These figures are appended for interest only and no reasons are offered for the fall and increase again in the tensile figures of the "H.2" bar between room temperature and 400 deg. C., although the phenomenon is believed to be a normal function of nickel-chrome cast iron at elevated temperatures.

Hardness Tests

Brinell hardness tests taken along a 12 in. length of 2½ in. dia. bar gave the results shown in Fig. 10, and it will be noticed that there is only a small variation in these figures throughout the length. Hardness tests taken across a section of 1½ in. dia. "Flocast" bar are set out in Fig. 11.

It will be readily apparent that the benefits to be obtained from continuously-cast iron bar are manifold, but while a distinctly worthwhile commercial success has been achieved there is still much to be accomplished. There is a very wide field in the engineering industry for this type of product, and already much experimental work has been put into the production of cast-iron tube. Whilst there is still a great deal of ground to be covered relative to tube production, results to date are very satisfying, and the possibility of pulling shapes in cast iron may be realized in the not too distant future.

FIG. 11.—*Results of hardness tests taken across a section of 1½-in. diameter "Flocast" bar.*



Acknowledgments

The Author is indebted to, and wishes to thank the directors of Harold Andrews Sheepbridge, Limited, Halesowen, for permission to publish this paper, and to express gratitude to all those who have assisted him in the work involved.

Machine-tool Orders in March

Machine-tool orders, which have been on the wane, picked up in March, although the figure of £6,400,000 (compared with £5,300,000 in February) was substantially below that of March last year. Domestic orders during the month rose compared with February by £800,000 to £4,600,000, but exports, although rising by £350,000 to £1,800,000 in the month, were down 27 per cent. in the first three months of the year. Domestic orders were down 11 per cent. for the quarter at £13,100,000. Domestic deliveries during March rose by almost £900,000 to £6,200,000 and export deliveries by £300,000 to £2,100,000.

Steel Centenary

The birth of a new age started in Sweden in July, 1858. Steel was produced for the first time on an industrial scale by a Swede—Göran Fredrik Göransson—according to the Bessemer method, which was invented and patented two years earlier by Sir Henry Bessemer. This Anglo/Swedish co-operation led the world in the technique of mass-produced ingot steel. On July 18, the centenary of this major development in the history of Swedish steel will be celebrated.

In theory the Bessemer method was highly promising, and had, actually, given good results in a number of single practical experiments. So far, however, as its exploitation on an industrial scale was concerned, it had proved impracticable, both to its originator and to those who had acquired rights to exploit it. G. F. Göransson was first to overcome the difficulties of its practical application and to start a regular steel-ingot production, and from that date on, the Bessemer method made distinct progress.

The Bessemer method consists of converting molten pig-iron into steel by forcing a blast of air through it. Compared with other methods used up to 1858, it gave much larger quantities of steel from a single heat, using considerably less fuel. The experiments initiated by Mr. Göransson were carried out at Edsken, situated some 10 miles west of Sandviken (Fig. 1) and the ingots were conveyed from there to the Högbo Forge situated on the outskirts of Sandviken. In 1862, feeling that the right time had come for further expansion of ingot production using the Bessemer method, Göransson founded the Sandvik Steel Works on the ground still in occupation as the main plant of the company. The Swedish Post Office has decided to commemorate these events by issuing two new postage stamps on July 18.

FIG. 1.—*The remains of the original blast-furnace near Sandviken, with, in the foreground, a replica of the old converter.*

British Non-Ferrous Metals Research Association

Annual Report, 1957

The British Non-Ferrous Metals Research Association has recently published its annual report for 1957, and the following extracts have been made from those sections having a major interest for foundrymen:—

It is reported that there has been an expansion in the income and the work of the Association during the last two years. All the available space in the existing buildings has been brought into use and the erection of a new building in Euston Street, which is well advanced, will not only provide more laboratory accommodation but will greatly aid the efficient use of an expensive London site. Experience has shown the tremendous advantage to members of the convenience of access of Euston Street and though a restricted site is an inevitable consequence, this handicap will be largely mitigated when the new plans are carried through.

Apart from the generous extra contributions of members, income from industrial members and total revenue income each increased from 1955 to 1957 by about 25 per cent. While enabling new lines of research to be undertaken, such as in the field of nuclear energy, instrumentation and the fatigue of structures, these new resources will be used mainly to provide urgently-needed extra space for the existing work of the various sections of the research department. It has also been possible to rearrange equipment and to increase the facilities available for work on the same lines as those prosecuted for many years.

The foundry is an important example of a seriously overcrowded department, the equipment of which is now being re-located to improve its effective use. A newly-acquired 600-lb. Ajax-Wyatt low-frequency furnace, which has been used under extremely cramped conditions for some months, will now be properly housed and the study of refractories for this type of furnace speeded up.

Specific Applications

A survey of furnace-operating economics has been carried out. Fuel costs, melting losses and metal quality were studied in a number of foundries using a variety of furnaces. The survey has enabled some of the more important criteria in the selection and operation of furnaces to be pin-pointed, and suggests that many foundries are using their furnaces with considerably less than optimum efficiency.

Running and gating, still largely a moulder's art, are becoming increasingly influenced by the application of scientific principles and rules for the design of systems suitable for different types of castings are being drawn up.

Work on the permissible limits of sulphur in gunmetals and phosphor-bronzes is being followed by a similar study of the effects on antimony, arsenic, and iron. With the high-sulphur content of the cheaper fuel-oils, sulphur pick-up is inevitable, but no evidence has been found that this is harmful and the tight limits in many foreign specifications seem unnecessary. The high-strength aluminium casting alloy L53 is being studied with a view to securing the optimum combination of strength and resistance to stress corrosion.

AN ORDER for 1,200 of a new design of hydraulic pitprops has been placed by the NCB with the manufacturers, Acrow (Engineers), Limited. Preliminary trials of this new prop have recently been completed. It is the company's first venture into the mining field.

Steel Castings for Heavy Machines

DEVELOPMENTS IN THE SOVIET UNION

The following abstract from an article in a USSR technical journal describes recent developments in the heavy-machine industry of the Soviet Union with particular regard to methods of mechanized moulding and casting currently employed in that country. A number of suggestions are made for improving the dimensional accuracy of large castings and mention is made of the hollow casting technique used at the Novo-Kramatorsk factory, one of the largest in the USSR.*

Considerable developments have taken place in the heavy-machine industry of the Soviet Union during the past 10 to 15 years. The largest works, established somewhat earlier, namely the Ural Machine Factory (of Sverdlovsk), still takes the lead, though another runs it close, namely the great Novo-Kramatorsk works. Others erected during the period named include the Southern Ural, in Orsk, and the Siberian Works in Krasnoyarsk. Besides new works, several existing ones have been modernized and enlarged, especially since 1946.

Mechanized moulding and casting, using the so-called co-ordinated bottom-board method was first developed in the USSR at the Ural Machine Works, and was soon adopted by others; and in most cases, included also new and improved forms of rapid interchanging pattern equipment which facilitated the still further development of foundry mechanization. With the co-operation of leading works, the TsNIITMash (Heavy Machine Research Centre) designed large moulding machines of capacity up to 39 tons.

At the present time the VPTI Collective and Novo-Kramatorsk works are developing new methods or improvements in connection with block moulding, whereby any given large mould may be assembled in the mechanized section from individual unit blocks prepared on moulding machines or sandslingers.

In the heavy-machine industry, mechanization of core preparation is still making slow progress, probably due to the fact that the engineers or technicians concerned have as yet found no satisfactory solution to the problem of using moulding machines for filling or tamping cores made in small lots. The large amount of time required for placing and fixing the corebox on the table of the moulding machine, and also the increased labour involved with shake-out coreboxes, practically neutralizes any possible economy from mechanical coremaking (tamping). Some progress, however, is perhaps apparent in the direction of sandslinging and sandblasting in coremaking.

For trimming and cleaning, it is claimed that the Research Centre has designed a hydraulic sand-cleaning (or blasting) plant that has been successfully used in the larger heavy-machine works, and that nothing similar has yet been developed in other countries. Another improvement is in the recovery of used moulding mixtures, including the wet reconditioning of sand. From experience gained in the Ural Machine Factory, it is estimated that, by this means, consumption of fresh moulding sands can be reduced to 300 to 500 kilos per metric ton of castings.

The use of pressure in connection with deadheads was first introduced in the Soviet Union in the heavy-machine industry. At present, the Research Centre and leading foundries are studying improved methods of heating with exothermic mixtures and electrically which would still further reduce metal consumption in this direction.

Still greater importance is attached to progress in the use of sodium silicate in moulding mixtures from research starting about 1949. Such compositions, in moulds and cores, have excellent setting properties both from a drying and chemical-action point of view, facilitated by treating (blowing) the moulds with carbon-dioxide gas or hot mixture thereof.

One of the most important tasks confronting foundrymen has always been, and still remains, that of reducing machining allowances. These allowances sometimes exceed the finished weight of the casting. The following suggestions are made for improving the dimensional accuracy of large castings (without pickup):—

(1) Use of chemically-setting moulding and core mixtures including sodium silicate, and blow-through with carbon dioxide before separation from pattern assembly. This was applied, for example, at the Staro-Kramatorsk works in shell-moulding of drop-hammer frames and bedplates.

(2) Use of moulding mixtures with exceptionally high thermal stability. In view of the fact that chemically-hardening moulding mixtures, based on quartz sand, do not always permit production (without pickup) of large thick-walled castings, it has been customary of late years to use chromic iron ore (chromite ore) and chromomagnesite in these mixtures. This ensures a very clean surface in carbon-steel castings, *e.g.*, with chrome iron ore; and for high-alloy steels chromomagnesite is preferred.

(3) Use of detachable parts and sectional patterns in order to reduce or eliminate slopes or profiles with high vertical walls and so lessen also the machining or other allowances. In this way, for example at the Ural Machine Works, with bedplate castings of rolling mills of net (clean) weight of 76.9 long tons, machining, etc. allowances could be reduced by 46 per cent.

(4) Reduction in area of machined surfaces. Work on improved methods of producing large castings of greater dimensional

* *Vestn. Mash*, 1957, Dec 28-32.

Steel Castings for Heavy Machines

accuracy was widely developed during 1956, when more than 59,000 tons of castings were made with reduction in machining allowance by not less than 20 per cent. as against the standard specified. This meant a saving of more than 2,950 long tons molten metal and of about 180,000 hr. of normal machining, etc., time. Castings weighing up to 226 tons are mentioned as being produced at the Novo-Kramatorsk factory.

At this same factory, in conjunction with the TsNIITM, research undertaken during 1953-55 included large, hollow steel castings from which would be prepared wrought blanks or semi-fabricates for tanks, cylinders, rollers and the like. Usually such forge-work, both in the Soviet Union and abroad, is done with high-power presses or stamps and supplementary operations. It is pointed out that attempts in other countries to make large hollow castings for this purpose have not been successful. Such use of hollow castings has permitted a reduction in weight from 90 tons for the continuous or massive casting to 80 tons for the hollow one; a matter of great importance in eliminating supplementary operations, such as upsetting, broaching, etc., with the use, where required, of less powerful presses. Holes in a casting can now be made with the aid of a steel thin-walled tube water-cooled, and without danger, for the water feed only operates after formation of a sufficiently strong crust on the casting.

Reverting to the hollow-casting technique, this found special application at the Ural Machine Works in 1956 in connection with semi-forgings for some of the most important components in steam- and gas-turbines. The vacuum process was used for castings up to 118 tons. Steam-turbine rotors forged from castings thus made are said to have had much better mechanical properties than hitherto, and were free from flake or scale.

Iron and Steel Industries exchange Training Scheme*

A scheme, organized by the Training Committee of the British Iron and Steel Federation, under which young executives from the industry visit steelworks in Europe, has now been running for 10 years. During this time, over 700 British trainees have participated in the scheme, and a similar number of foreign trainees have been received in this country.

Nine countries take part in the scheme: they are Austria, Belgium, France, Germany, Holland, Italy, Luxembourg and Sweden; in fact, all the major steel-making countries of Western Europe. A hundred young managers, or potential managers, from British steelworks, go to these countries every year to spend a month at an iron and steel works, and in return their companies receive a hundred similar men from abroad. One in three of these are from Germany, one in six from France, and the rest divided fairly evenly among the other six participants. The men are chosen by their companies; all the expenses are paid by the Federation and its counterparts abroad.

Trade with Russia Increasing

When visiting Glasgow recently, to arrange contracts between firms there and in Russia, Mr. Thomas G. Slade, director of F. C. Milligan, Limited, expressed the opinion that UK trade with Russia was rapidly increasing. This country he said, had, in 1954, sold goods worth only £3,000,000 to the USSR, last year this figure rose to £37,000,000; it was hoped that this year £50,000,000 would be reached and next year £100,000,000. He added that industrialists were learning that Russia's orders were big, that they paid quickly, and kept contracts to the letter. He warned them not to underestimate the Russians, who, he said, were fine craftsmen, and had the technical and practical knowledge to produce the machinery they needed, what they lacked, however, was time. Russia, he said, wanted our machinery because she was a young country industrially. There were other countries after the market, and Britain should be in the forefront of demand. Britain's keenest rivals were western Germany.

* Extracted from *Training* published by the Federation from Steel House, Tothill Street, London, S.W.1.

BTC orders New Catering Stock

Orders for 100 new catering vehicles and electrical equipment in connection with the railway modernization plan have been placed by the British Transport Commission. The new stock will come into use next year. Charles Roberts & Company, Limited, is to provide 12 kitchen cars for use in the London Midland Region, and Cravens, Limited, the same number of kitchen-buffet cars for the region. Cravens will also supply 15 kitchen-buffet cars for the Eastern and Northern regions.

The Birmingham Railway Carriage & Wagon Company, Limited, will supply 19 unclassed restaurant cars for Eastern and North Eastern (15), and Scottish Region (four); four first-class restaurant cars for London Midland Region; 38 restaurant-buffet cars for Eastern (two), London Midland (13), Scottish (six), Southern (nine), and Western regions (eight).

Tungstone Products, Limited, is to supply and erect 182 lead-acid electric batteries and charging equipments for electrification schemes in the London Midland, Scottish, and Eastern regions.

Edgar Allen's Higher Profits

Group net profits of Edgar Allen & Company, Limited, steelmakers, etc., of Sheffield, rose from £292,916 to £400,265 in the year ended March 29, 1958, and, as forecast in January, a 7½ per cent. final makes a repeated 12½ per cent. dividend for the year, during which tax charged was £366,576 (£360,414). The net profit includes special credits of £42,319 (£40,050) and debits of £17,800 (£4,284). The directors state that the value of the group's turnover is 6 per cent. more than last year's.

The dividend, on an ordinary capital of £1,753,780, again absorbs £126,053 net. Provision for depreciation this year has been calculated, in the case of the parent company and three UK subsidiaries, "at rates more appropriate to the present condition and expectation of life of their fixed assets than those hitherto used." As a result, the provision made by the parent company is less by some £50,000. The effect in the accounts of the subsidiary companies is relatively small.

American Foundrymen's 62nd Castings Conference

Technical Material Presented at Cleveland

The exhibition side of the recent Casting Congress at Cleveland, Ohio, has already received mention in the JOURNAL. *In what follows abstracts are given of some of the technical papers which were presented to delegates and members of the American Foundrymen's Society during the various sessions which were held throughout the week. From almost* 100 *such papers the ensuing have been selected as having the most direct interest for British foundrymen.*

Steel-scrap Specifications for Duplexing Cupola White Iron

By R. H. Greenlee

R. H. Greenlee, of Auto Specialties Manufacturing Company, St. Joseph, Michigan, reported the importance of specifying proper grades of steel melting scrap to obtain optimum results in cupola melting for the duplexing process of preparing metal to be cast as white iron. He cited chromium at 0.04 per cent. as excessive and only correctable by small 0.01 to 0.02 additions of boron. Chromium contents exceeding 0.07 to 0.08 per cent. retard or prevent annealing in malleable grades of iron.

He classified steel for this use into four grades:—1. Sheet-bushelling. 2. Thicker clippings. 3. Medium thickness—$\frac{1}{8}$ to $\frac{1}{2}$ in. 4. Heavy—$\frac{1}{4}$-in. thick and over. He found that 50 per cent. new metal in tests showed that lower oxidation loss, melt loss, lower chromium content, etc., resulted from type 4 scrap steel. "End" costs could be correlated which showed approximately a 10 per cent. saving when using the heavier materials.

Some discussion regarding oxidation during melting followed; this loss had to be added to the oxidation due to rusty scrap. The cupola used was 22-ft. high, held seven charges of $2\frac{1}{2}$ tons each, and melted about 16 tons per hr. Analyses for carbon, silicon, manganese and chromium were made every 12 min.

The author concluded that any clean, uncontaminated scrap with a relatively small surface-to-weight ratio within the prescribed classification limits would qualify best for duplex metal (cupola to air furnace) white iron to black-heart malleable iron production.

Effect of Pressure during Sodilification on Microporosity in Aluminium Alloys

By S. Z. Uram, M. C. Flemings and H. F. Taylor, Massachusetts Institute of Technology.

Aluminium alloys 356* and 195* were solidified under pressure varying from atmospheric (15 lb. per sq. in.) to 16.7 times atmospheric (250 lb. per sq. in.). Pressures greater than atmospheric were found to result in a substantial reduction of microporosity in sand-cast test specimens. The test castings were adequately risered, and the alloys thoroughly degassed.

The void volume of 7 per cent. at atmospheric pressure could be reduced to 1 per cent. at 100 lb. per sq. in. pressure. The reduction in porosity effected by greater-than-atmospheric pressure during solidification was found to result in little improvement of mechanical properties in solution treated and aged test-bars.

An analysis of the test results indicated that the microporosity in the test specimens studied was probably caused primarily by precipitation of minute amounts of gas during solidification.

The Foundry and Preventive Maintenance

By C. E. Fausel

Mr. Fausel, who is connected with the Central Foundry Division, General Motors Corporation, Danville, Illinois, described in the above paper a programme of inspection and overhaul of shop equipment on an "advanced" schedule which prevents failures and delays by the replacement and repair of worn equipment before stoppage occurs.

Improving Electric-Furnace Refactory Life by Special Shell-cooling Techniques

By Vernon J. Howard, Oklahoma Steel Castings Company, Division American Steel & Pump Corporation

The equipment referred to in the paper was a two-ton, direct-arc, top-charge, acid-lined furnace employing an 8-in. electrode. The average size of the heats was 7,700 lb. The unit was used for producing all types of steel from plain carbon to American Iron and Steel Institute 347 stainless. On a full-production schedule, it produced a heat every 65 min. with 22 heats scheduled per day. In 1952, an incentive system of statistical controls was set up. Along with chemical and temperature controls, records of delays were maintained showing the cause and length of the shut down. Analysis of these records revealed that the principal cause of delay was trouble with the water coolers. This cost 1,354 min. in delays for the year, or practically one full working day.

Roof designs were changed and the electrode ring coolers were redesigned. In 1953 with these changes a decrease of 923 min. was effected. This was enough time at the present melting rate to produce 49.4 tons of metal while the furnace was down for repairing water lines the previous year.

* 356 Alloy—Nominal composition: Si 7 per cent., Mg 3 per cent., Ti 18 per cent.; 195 Alloy—Nominal composition: Cu 4.5 per cent., Ti 18 per cent.

AFS 62nd Castings Conference

Annealing of Malleable Iron: Effect of Repeated Annealing on Rate of Second-stage Graphitization

By J. E. Rehder, Canada Iron Foundries, Limited

An examination into the process of eliminating pearlite in the annealing of blackheart malleable iron was reported. A low-phosphorus duplex metal had been studied in this connection. The first stage of breaking down iron carbide, Mr. Rehder pointed out, was understood and predictable, but the second stage of getting rid of pearlite was more difficult. There were two ways for its accomplishment, the more common of which involved cooling rapidly into the critical range and then holding until decomposition to ferrite was complete. The second method avoided forming pearlite by proceeding directly through the critical range from austenite to ferrite.

Experiments had been conducted on a cast iron containing approximately carbon 2.50, silicon 1.50, manganese 0.40, sulphur 0.05, phosphorus 0.04 and chromium 0.04. The first stage of graphitization was accomplished in 2½ hrs. at approximately 954 deg. C. and the specimens cooled to 788 deg. C. followed by cooling at 6 deg. per hr. to 704 deg. C. The experiments involved cooling in the critical range at rates varying from 6 to 21 deg. C. per hr. These results indicated that the hardness was greater for a faster cooling rate but that a repeated cycle produced increased annealability in amounts of as much as 85 per cent. on the first repetition. A hardness decrease from 70 to 55 Rockwell B could be expected. This effect apparently is independent of the soaking time at the high annealing temperature. Discussion developed the fact that re-annealing caused reduced mechanical properties and that nitrogen content decreased with re-annealing.

This picture, just received, of the American Foundrymen's Society Convention in Cleveland (May 19 to 23), gives some idea of the arrangement of stands. Considering that it was strictly a foundry equipment and supplies exhibition, and therefore of limited interest to the general public, the attendance of 12,400 was remarkably good.

Analogy between Carbon Deposits on Refractories and Spheroidal-graphite in Iron

In a paper by E. W. Roberts and B. E. Vassiliou entitled "Carbon Deposits from the Thermal Decomposition of Town Gas," Research Paper 358, presented in the UK before the British Ceramic Research Association, the Authors describe and discuss carbon deposits on fired refractories and factors governing their formation. They state that carbon derived from the thermal decomposition of moisture-free town gas and deposited on refractories gave diffuse X-ray patterns of micro-crystalline graphite. The deposits consist of botryoidal aggregates and segmented filaments, the latter up to 1-in. long, being aligned in the direction of gas flow.

In the introduction to the paper, the Authors describe the carbon coating on the specimens as follow: During the examination of refractories that had been fired in an atmosphere of moisture-free town gas, the surface of the carbon coating the specimens was seen to be made up of an aggregation of spherical shapes, *i.e.*, a botryoidal structure. Next follow various experimental data, observations (including general examination of the material and examination by reflected light). Finally, the Authors draw a number of conclusions from their evidence, including a postulation of the mechanism of formation of the aggregates; the rôle of hydrogen; comparison with other materials having similar features; and, in particular, comparison between spheroidal-graphite and botryoidal carbon, and methods of inducing the formation of spheroidal graphite in cast iron. It is this latter analogy which is of major interest to founders and the section is reproduced in what follows:—

Basis for Comparison

In their remarks under the heading of "Comparison between Spheriodal Graphite and Botryoidal Carbon," the Authors mention that in considering the occurrence of the apparently discrete radial crystals in botryoidal carbon, it might be of interest to mention graphite spheroids formed at high temperature in nodular cast iron, in which the spheroid is composed of graphite crystals growing from the centre, *i.e.*, a radial disposition of the "c" axes with only roughly tagential arrangement of the basal planes. They continue in their final section by considering methods of inducing the formation of spheroidal graphite, and summarize the existing state of knowledge as follows:—

The main methods of producing spheroidal graphite in cast iron, industrially, involve treatment with cerium or magnesium.[1] Several theories have been proposed to explain the mechanism, but none has been generally accepted.[2] One theory assumes that a foreign element is necessary in order to induce nucleation with the subsequent formation of a spherulite, the habit of the graphite depending on the lattice of the nucleating element according to the mechanism of epitaxis. Another theory explains the spherulite growth by a screw-dislocation mechanism induced by foreign elements.[3]

The elements that promote the formation of spheroidal graphite are all strong deoxidizers and their effect is cumulative. Hültgren and Östberg[4] induced the formation of spheroidal graphite by raising the hydrogen content above five per cent. Two effects are likely to result from the small proportions of magnesium or cerium, etc., added to cast iron:—(1) Surface tension could be lowered, the wetting properties between metal and graphite thereby being altered. It has been observed that flake-graphite iron, melted in an atmosphere of helium in a graphite crucible, caused wetting, whereas spheroidal graphite with magnesium did not.[5] (2) A change in the free energy of the alloy would confer greater mobility on the carbon and so retard graphitization. Iron containing magnesium has greater shrinkage during solidification than has ordinary grey cast-iron.[6, 7] The presence of oxygen and nitrogen is believed to prevent more complete solidification contraction; it has been suggested that these gases are removed from the flake-graphite irons by the magnesium. Similarly, hydrogen would increase mobility and retard crystal growth—by atoms attaching to the edge atoms of the crystallites as well as by affecting the interfacial energies.

At the risk of taking the analogy of colloidal deposits too far, the Authors suggest that the graphite spheroid in nodular cast-iron may be a pseudomorph after a spherical aggregate of layer groups. The development of true graphite structure in the form of radiating crystals could be partly due to thermal contraction, but primarily perhaps to the compression during the solidification contraction of the metal.

The Authors conclude their paper by referring back to the gas flame deposits and stating that other deposits formed under similar conditions in gas retorts[8] and from ethylene and methane show a structure similar to that of the deposits reported.

REFERENCES.

[1] Morrogh, H., *J.* Iron & St. Inst., **176,** 378, 1954.
[2] Ward, E., *Metallurgia*, **50,** 155, 1954.
[3] Hillert, M., and Lindblom, Y., *J.* Iron & St. Inst., **176,** 388, 1954.
[4] Hültgren, A., and Östberg, G., *ibid.*, 31, 1954.
[5] Buttner, F. H. Taylor, H. F., and Wulff, J., *Amer. Foundryman*, **20,** 49, 1951.
[6] Hughes, I. C. H., *Proc.* I.B.F., **45,** 157, 1952.
[7] de Sy, A. L., *Metal Progress*, **59,** 798, 1951.
[8] Roberts, E. W., Gas Council *Res. Comm.*, GC39, p. 7, 1957.

£25,000,000 Order for Demag

Estimated to be worth more than £25,000,000, an order has been received by the Duisburg, West Germany, firm of Demag, from the Argentine Zapla Works. It covers the supply of blast-furnace equipment and complete installations for an integrated steelworks.

Foundry Employment in Scotland

From Scotland comes a report that whilst some foundries are maintaining full employment others are introducing short-time working. Amongst those recently commencing a four-day week is the Heathfield foundry of James Dickie & Company (Drop Forgings), Limited, Ayr. The reason is said to be due to a seasonal recession in trade, and the company expects by short-time working to be able to "spin-out" the work up to the Fair holiday period in July. Mr. Boyd, the manager, has stated that "Although quite a number of new customers are coming along, the orders are mainly for small quantities. There is, however, the possibility of development with these new orders.

The Kyle Foundry of J. M. Rodger & Son, Limited, Ayr, has been working short-time for the past four or five weeks. In reference to this, Mr. M. M. Stubbs, director of the firm, said "In our case the seasonal trend has nothing to do with us. We have been operating a four-day week for our 30 foundry workers in common with the general situation in industry in Britain."

Another Ayr firm of ironfounders, A. & J. Hunter, Limited, have managed to keep up a regular five-day week. Mr. John Hunter, director, said: "We have no reason so far to introduce a four-day week. We are managing to keep steady." The firm employs an average of 20 foundry workers. Alexander Ferguson (engineers and brassfounders), Limited, Ayr, are working a 54-hour week at present. Mr. Alexander Ferguson, managing director, said: "We are extremely busy. There has been no recession in our trade. In fact we are working overtime three days a week." He said he had been able to engage one of the local foundry workers affected by short-time working, but there were no other vacancies at the foundry at the moment.

MIRRLEES WATSON COMPANY, LIMITED—Mr. J. Malley, a director since 1946, has been appointed joint managing director along with Mr. D. M. Semple.

Shaw Process in Europe

European licensees of the Shaw Process held a three-day convention early last month, based on London and Crawley, Sussex. On the first day, there was a reception and an opening address by Mr. Noel Shaw, followed by technical contributions from Mr. J. Osborn (Samuel Osborn & Company, Limited); Mr. Timms (Armstrong Siddeley Motors, Limited); Mr. P. A. Crooke (Armstrong Siddeley (Brockworth), Limited); Mr. C. F. Widmer (Close Tolerance Castings, Limited); Mr. A. Brayshaw and Mr. A. Barnsley (Darwins, Limited), and Mr. D. B. Winter (Innsworth Metals, Limited).

Following luncheon, Mr. Nicholas Herzmark (Ausma S.A.) of Paris and Montreux, gave the opening address of the afternoon session. Technical contributions followed from Mr. A. Asua (Metales Ampe S.A., Bilbao); Mr. G. P. Welch (Wolverhampton Die Casting Company, Limited); Mr. N. A. Shaw (Shaw Processes, Limited); the Riken Pistonring KK concern (Tokyo), and Mr. Clifford Shaw (Shaw Processes, Limited). A general discussion followed these contributions and after the tea interval, two technical films were shown. These were "Mould Production Developments," presented by Mr. H. J. Marshall, and "A Foundry for New Techniques," presented by Mr. J. Osborn.

The second day of the convention was devoted to tape-recordings of contributions from the group's US convention. These were generally agreed to be of great interest, not only for the value of the technical contributions made in papers and discussion, but also as an indication of the whole spirit and atmosphere of the convention, which was admirable in its completely frank and open exchange of problems and experience among licensees, who perhaps could be regarded as competitors.

The third day was taken up by a visit to the Crawley works of Close Tolerance Castings, Limited, in association with Clino Foundry Supplies, Limited. Here, there was a demonstration of the latter firm's newly-developed melting and casting furnace.

"Pointing the Way"

The illustration shows an unusual piece of sculpture which is to form the centrepiece in the forecourt of the recently-completed building at 195-197, *Knightsbridge, London. The group which is one-and-a-half times life size shows a kneeling man "pointing to the future" with two young children at his side. It was cast in bronze at the Morris Singer Foundry, Clapham. To the left is Mr. Gilbert Ledward and with him is the architect of the new building, Mr. Guy Morgan. They were visiting the foundry to inspect the piece which comprises one of the most modern and prominent works of statuary in London.*

Company News

H. M. HOBSON, LIMITED, aircraft engine component manufacturers, of Wolverhampton—The directors are applying to the Capital Issues Committee for consent for a scrip issue capitalizing £800,000 reserves.

TRIPLEX FOUNDRY, LIMITED—For the year to March 31, 1958, net profit was £22,978, compared with a loss last year of £72,319, but for the third year running there is no dividend. Tax of £3,970 (£16,110 recovered) leaves a net profit of £19,008 (loss £56,209).

AIRSCREW COMPANY & JICWOOD, LIMITED, laminated wood producers, and manufacturers of fans, propellers, etc., of Weybridge (Surrey)—A 10 per cent. dividend is maintained, but last year's 2½ per cent. bonus is not repeated. Net profits for the year 1957-58 are £55,717 (£51,143).

HENRY HOPE & SONS, LIMITED, metal window manufacturers, etc., of Smethwick—For the year to March 29, 1958, group trading profits, etc., are £1,142,229—an increase of more than £40,000—and the dividend is up from 10 per cent. to 11 per cent. After tax of £616,835 (£634,462), net profit is £525,394 (£467,214). After allowing for moneys retained by subsidiaries, net profit of the parent company is £270,231 (£242,815).

F. H. LLOYD & COMPANY, LIMITED, steelfounders, of Wednesbury (Staffs)—A drop in group net profits from £427,221 to £329,733 is announced for the year to March 31, 1958. Tax was £375,829 (£404,195) and depreciation £287,128 (239,745). Last year's 12½ per cent. dividend is maintained with the announcement of a 10 per cent. final. There is £348,798 (£423,395) attributable to the holding company after adjusting a net loss of £19,065 (£3,826 profit) of minority interests.

RANSOMES SIMS & JEFFERIES, LIMITED, engineers, ironfounders, etc., of Ipswich—This year's general trading position so far was much the same as last year's, said Sir Reuben Hunt, presiding at the annual general meeting on June 24, there still being "considerable difficulties" in overseas markets because consumers' buying power had fallen. The "Fordson Dexta" tractor went into quantity production early this year and over 11,500 have so far been sold in world markets, and it is expected that the autumn trade "will feel the benefit of this significant development."

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

WAREHAM AND PURBECK, July 28—Construction of approximately 2½ miles of 4-in. dia. spun-iron water mains, together with fittings, communications pipes, etc. Documents from the engineer and surveyor, Arthur G. Flatt, Westport House, Wareham, Dorset. Deposit £3 3s. 0d.

PENISTONE, August 8—Construction of spun-iron pipe sewers, 6-in., 9-in., and 12-in. dia., and about 200 lin. yd. of spun-iron rising main 4-in. dia. Documents from the Clerk of the Council, Mr. J. Hodgkinson, Penistone Rural District Council, Council Offices, Thurlstone, Sheffield, on or after July 9. Deposit £3 3s. 0d.

FLEET, July 28—In connection with the construction of a sewage pumping station, requirements include approximately 100 lin. yd. of 12-in. and 15-in. dia. spun-iron pumping main and sewer, manholes, hatchboxes and other appurtenant works. Documents from John Taylor & Sons, Artillery House, Artillery Row, Victoria Street, Westminster, London, S.W.1. Deposit £5 5s. 0d. (by cheque only).

BELGIAN CONGO, July 24—Two mechanical shovels, track-laying diesel-engine type. (ESB/15561/58.)

SOUTH AFRICA, July 10—Machine tools. (ESB/15401/58.)

Publications Received

British Iron & Steel Federation. An account of the Central Organization. Published by the Federation at Steel House, Tothill Street, London, S.W.1.

This is a straightforward description of how the iron and steel industry is organized, what the Federation does and what it does not do, that is, only through liaison has it anything to do with either iron or steel castings. The comparatively recent activities in the field of educational training are both described and illustrated. The constitution of the Federation has been included as an appendix, a wise thing to do now that such matters interest the Monopolies Commission.

Transactions of the Manchester Association of Engineers, 1954-55, 1955-56. Published by the Association from 18, Booth Street, Manchester, 2.

The educational authorities to-day are calling for a wider-based curriculum for technological students. Attendance at the meetings of the Manchester Association of Engineers will provide this in good measure, as this is no specialized organization but one that is extremely catholic in its choice of lectures. In these two volumes, the lectures cover historical, metallurgical, civil, mechanical and electrical engineering subjects. This is exactly what a local engineering society should do—that is, widen the vision of its members.

Metallurgical Applications for the Rare Earths—a bibliography prepared for the Davison Chemical Company, Baltimore, 3, Maryland, USA, by Ammiel Prochovnick.

This 22-page cyclostyled brochure carries 171 references to technical literature. That is a considerable number to wade through with neither a contents list nor index to guide one. Fortunately, the survey is restricted to nodular cast iron; stainless steels; light alloys; chrome- and nickel-containing heat-resisting alloys and cigarette-lighter flints. There is an interesting note that photocopies of most of the articles abstracted are available.

Wear (*Usure, Verchleiss*), **Vol. 1 (1957/58).** Published at intervals by Elsevier Publishing Company, 110-112, Spuistraat, Amsterdam, Holland.

This new magazine carries no advertisements. The contributions are printed in any of the three languages (English, French and German) with, out of the first four issues, English predominating. There is a paper from Dr. Angus of the British Cast Iron Research Association, and a second one on the wear of cast-iron liners. A volume will contain about 500 pages.

Symposium on Aluminium and its Alloys in Electrical Engineering. Published by the Aluminium Development Association, 33, Grosvenor Street, London, W.1.

The symposium was held in May 1957, and the 12 papers presented, together with the discussions which took place, are assembled in this 375-page book. It will rank high for a long time as a major contribution to the subjects covered.

Wheelabrator-operator's Manual. Issued by Tilghman's, Limited, Broadheath, Altrincham, Cheshire.

Unquestionably a study of this 32-page pamphlet by the men who operate these machines will make them much more knowledgeable as to how to handle and maintain them in good condition. In according this service to the foundry industry, Tilghman's set an example well worthy of emulation by other makers of equipment.

News in Brief

TRANSPORTES OCHOA S.A., a large Madrid transport company, has placed an order worth over £90,000 with Leyland Motors, Limited, for 26 heavy-duty tractors.

LEVERTON OF LEEDS, LIMITED, a subsidiary of H. Leverton & Company, Limited (agricultural engineers and tractor distributors) opened, on June 5, a new depot and showroom at Gelderd Road, Gildersome, near Leeds.

THE FOUNDATION STONE of a new £100,000 foundry for The Mint, Birmingham, Limited, was laid on Thursday, June 19. The casting shop, covering 20,000 sq. ft., will be situated next to the main Icknield Street building, which dates back to 1860. The foundry should be completed next year.

LATEST REPORT by the Government Actuary on the working of the National Insurance Act shows that out of 2,100 deaths in 1956 for which industrial death benefit was paid, about 600 were on account of death from pneumoconiosis. In the previous year the number was also 600, but out of a total of 2,400.

THE RENFREW FIRM of Babcock & Wilcox, Limited, boilermakers, have secured a contract worth nearly £1,000,000 from the Central Electricity Authority. It is for the whole of the coal, ash and dust-handling installation for the board's Northfleet (Kent) power station. The company hopes to complete the plant by July next year.

AS FROM JULY 1, Associated Chemical Companies, Limited, announces, products manufactured by British Chrome & Chemicals, Limited, and Brotherton & Company, Limited, will be handled by a newly formed subsidiary, Associated Chemical Companies (Sales), Limited, with its registered office at Brotherton House, Westgate, Leeds, 1.

WILD-BARFIELD ELECTRIC FURNACES, LIMITED, of Watford, announce that they have recently received from the United States an order for 28 750-lb. capacity mains-frequency induction-heated aluminium holding furnaces valued at nearly $300,000. This order was received despite severe competition from American furnace manufacturers.

THE FOUNDRY MACHINERY DIVISION of Baker Perkins, Limited, which has up till now been operating from the Peterborough works, from the beginning of this week has moved to Bedewell works, Hebburn-on-Tyne. All sales, administration and manufacturing will take place at Bedewell where there is also an experimental bay for demonstrations.

AT THE HIGH-ALTITUDE TEST PLANT of Rolls-Royce, Limited, at Derby, a pair of thrushes built a nest behind a big air by-pass duct, which when in use carries air at a temperature of −50 deg. C. This low temperature nearly killed the thrushes, so scientists provided a hot-air device to keep the nest warm, and the thrush family were saved.

MALTBY ORDNANCE FACTORY officially closed down on Friday, June 27. There was a wartime strength of 5,000 employees—now only a score of workpeople remain. All the production workers have been transferred to other factories. So far there has been no definite action for the factory to be taken over either by private enterprise or nationalized industries.

REMPLOY, LIMITED, the national organization employing the severely disabled, announced recently that its sponsorship arrangement with the Igranic Electric Company, Limited, of Bedford, is to be extended. For some time Remploy's workers have been assembling some of the company's small auxiliary switches. They are now to assemble its new range of heavy-duty, oil-tight control units.

A TEN-INCH SILVER MODEL of the giant radio-telescope at Jodrell Bank, Cheshire, was presented to the Queen and the Duke of Edinburgh when they visited Scunthorpe, on June 27, to make a tour of the Appleby-Frodingham works. The 1,800 tons of steel used in the construction of the telescope was produced at the Appleby-Frodingham plant and fabricated in its structural workshops.

THE INVESTMENT of nearly $2,250,000 in ordinary shares of Monsanto Chemicals (Australia) is announced by the US Monsanto Chemical Co. The money will finance the acquisition of D.H.A. (Chemicals) Proprietary and Beetle-Elliott Proprietary from Drug Houses of Australia. Monsanto Chemicals, Limited, London, S.W.1, will still have the majority holding in the Australian company.

A SHEFFIELD FACTORY managed by Thos. Firth & John Brown, Limited, which for eight years has been making metallic thorium, a fuel which can be used in nuclear energy reactors, is to close before the end of the year. The Atomic Energy Authority is now able to carry out the manufacture of the fuel itself. The total cost of erecting and maintaining the factory from 1950 to last year was £900,000.

COCKBURNS, LIMITED, valve makers, Cardonald, Glasgow, who some time ago formed a subsidiary company in the Netherlands—Cockburns (Nederland) N.V.—now announce that they have established a production unit at the Schiedam factory. The unit has been designed to manufacture principally safety valves and relief valves for gas, vapour, and fluid service, applicable to both land and marine installations.

AN AMALGAMATION IS ANNOUNCED between the Compagnie de Fives Lille and the Société Française de Constructions Mechanique (formerly Cail). The new company will be known as the Société Fives Lille—Cail, and the head office will be at 7, rue Montalivet, Paris 8. Mr. Henri Prangey is the honorary president of the new company, Mr. Jacques Thibault, the president, or chairman, and Mr. Marcel Wilz the managing director.

Mr. GEORGE W. CANNON gave the main address at the convocation assembly at Michigan Technical College, on May 27. Mr. Cannon with associates founded the Campbell, Wyant and Cannon ironfoundry concern in 1908, which has grown to be the largest of its kind—that is an unattached concern—in the United States. The three original partners each contributed £200 and drew out £3 per week until the business was established. It now employes 6,500 people.

STANTON IRONWORKS COMPANY, LIMITED, is to blow out its Stanton No. 4 furnace for relining and repairs on July 11, and because of a reduction in pig-iron orders, four-furnace operation will not be resumed until the end of August. Consequently there will also be some reduction in operations at the coke ovens. There will be no redundancy, and it is hoped that short-time working will be avoided by some rearrangement of the annual holidays for employees in the departments affected.

THREE VISITORS from the Yugoslav concern, Industrija Motora, spent last Thursday and Friday at Triplex Foundry, Limited, Tipton, Staffs, where they saw some of the most up-to-date methods of mass-producing high-duty engineering castings in grey iron. The visitors were Mr. Neddjkovic (an inspector); Mr. Nikolic (a patternmaker), and Mr. Tasic (a coremaker). Also scheduled, were visits to the other foundries in the Triplex Foundries group, the Great Bridge Foundry Company, Limited, and Vowles Aluminium Foundry

Company, Limited, West Bromwich. The visit was arranged in conjunction with F. Perkins, Limited, diesel-engine manufacturers, Peterborough.

THE Birmingham Exchange and Engineering Centre has announced the details of a scheme, the objective of which is to reduce the high costs incurred by British engineering firms in entering Canadian engineering exhibitions. Outlining a scale of new charges under the scheme, Mr. Anthony J. Cox, manager of the Centre, revealed that the new rates for space range from £40 12s. to a maximum of £174, the latter covering an area of 120 sq. ft. Inclusive services will be available, covering such items as the employment of administrative staff to deal with enquiries and publicity. The scheme will be implemented at the National Industrial Production Show of Canada, to be held in Toronto in May 1959.

BECAUSE OF A DECLINE IN ORDERS for pig-iron, there is a possibility of redundancy at the Holwell ironworks at Melton Mowbray, Leicestershire. According to the pension scheme operated by the Stanton Ironworks Company, Limited, the retiring age should be 65, but due to a one-time scarcity of labour, employees who wished to do so have been allowed to continue working beyond that age. Now, as a preliminary step, all employees of 70 years of age and over, of which there are about 25, are being asked to retire. In all there are about 1,500 employed at the Holwell works. The No. 3 blast-furnace at the works, which has been in operation since 1949, is due to be blown out in mid-July; normally it would have been replaced by No. 2 blast-furnace, but this will not be done now until there are signs that trade is improving.

THE SIERRA LEONE DEVELOPMENT COMPANY, which mines iron ore in the Port Loko District, is to spend about £1,000,000 on the development of Pepel, the port on the left bank of the Sierra Leone River from which the ore is shipped. Development projects will include the extension of the stores jetty, building of new dwelling houses, the building of a large locomotive shed, the installation of a pipe-borne water-supply system and the extension of existing bunkering and loading installations to provide for an increased output of concentrates. Mr. Siaka Stevens, the company's public relations officer, has said that the lump-ore era at the Marampa Mines is coming to an end and the era of powdered ore is reaching its zenith. He added that a second mill for treating powdered ore is now under construction at Marampa, and the work is due to be completed before the end of this year. This second mill will produce 500,000-tons of concentrates annually.

Obituary

Dr. MORAY MELVIN, medical officer at the Yorkshire Copper Works (Yorkshire Imperial Metals, Limited), Stourton, near Leeds, for 18 years, died on June 20 at the age of 62.

Mr. ERNEST HART, steelworks manager of the Steel, Peech & Tozer branch of the United Steel Companies, Limited, Rotherham (Yorks), where he had been employed for 40 years, died on June 20, at the age of 63.

Mr. WALTER SHAW, chief wages clerk at the Ecclesfield works of the Brightside Foundry and Engineering Company, Limited, died suddenly on Wednesday, June 25, at the age of 38. He had been with the firm for 20 years.

Mr. CHARLES DAVID SYKES, a former director of the Oldbury chemical firm, Albright & Wilson, Limited, has died at the age of 83. Mr. Sykes joined the firm in 1898 as an assistant research chemist and later became works manager. He became a director in 1928.

Mr. HAROLD PRICE, who began as an apprentice with Belliss & Morcom, Limited, engineers, of Birmingham, in 1913, died recently at the age of 61. After serving with the RNAS in the first world war, he returned to Belliss & Morcom, and in the mid-'20s went to India for the company, remaining there until his retirement a few years ago.

Mr. NORMAN DICKENSON MARSHALL, son of the late Major H. D. Marshall, former managing director of Marshall, Sons & Company, Limited, engineers, Gainsborough, died suddenly last Thursday. He worked with the firm until 1938 and he had held the posts of salesman, manager and works manager, but never joined the board. In 1938, he joined Arthur Lee & Son, Limited, steel makers, Sheffield, and later acquired the concern of Fosters, Limited, builders' merchants, Gainsborough, of which he was managing director.

House Organs

Vulcan. Vol. XIV, No. 2. Published quarterly by the Vulcan Boiler & General Insurance Company, Limited, 67, King Street, Manchester, 2.

This issue gives a fully-illustrated description of the cause of leaks in cast-iron inlet pipes. These are shown to be due to the use of chaplets and the author recommends discontinuance if other means can be found.

Foseco Foundry Practice, No. 130; issued by Foundry Services, Limited, Long Acre, Nechells, Birmingham, 7.

Much space is devoted in this issue to degassing developments and comparison is made between nitrogen, chlorine, and the proprietary material developed by the company. The layout of the article on the "Failure of Gunmetal Test-bars" is marred by having the sub-titles more prominent than the main heading.

The Electric-tool User. Spring 1958. Issued by Wolf Electric Tools, Limited, Hanger Lane, London, W.5.

This magazine is for external circulation and is sent to 65,000 users. The application of portable power tools to a variety of work on factory floors, benches and on site is well illustrated, and a number of the applications have obvious interest for founders.

New Catalogues

Malleable-iron Tube-fittings. The Le Bas Tube Company, Limited (Works: Britannia Iron & Steel Works, Bedford) have an easier task than most foundries, as they sell a continuous line of goods for a well-defined market and not, as is the case with a number of foundries, a service starting from the blueprint of a pattern to a finished casting. In this abridged 52-page spirally-bound catalogue, there are included many tables, one of which is devoted to the general supply of malleable castings. This shows the material is no better or worse than that turned out by the jobbing malleable founder, but the rest of the catalogue does lend itself to specialized treatment, and this has been effected very acceptably.

Fork Trucks. In publication No. 4/484, Ransomes & Rapier, Limited, Waterside Works, Ipswich, describe and illustrate two sizes of fork trucks, both lifting 18,000 lb. loads, but at two distances (24 in. and 33 in.) from the face of the fork. The details are clearly set out in a specification.

Personal

Mr. G. DRING retired from the board of Bakelite, Limited, on June 30. He will continue in a non-executive capacity as technical consultant.

Mr. D. C. MCCANCE has been appointed secretary of John Allen & Company (Glenpark), Limited, one of the Metal Industries group of companies.

Sir WILLIAM STANIER has been re-elected president of the Production Engineering Research Association. Sir LIONEL KEARNS has been re-elected chairman of Council.

Mr. FREDERICK J. WALLACE has become secretary of the Marshall organization, engineers, Gainsborough, Lincolnshire, in succession to Mr. ARTHUR MAKIN, who has retired.

Mr. A. F. JOPLING, a director of Blackburn & General Aircraft, Limited, has been appointed a director of its subsidiaries, Blackburn (Dumbarton), Limited, and Thomas Green & Son, Limited.

Mr. G. M. WARREN has been appointed to the board of Aveling-Barford, Limited, from July 1. Mr. W. MORRIS and Mr. E. B. WATKIN have been appointed to the local board of the company from that date.

Mr. JOHN CRUISE has joined Geo. Salter & Company, Limited, of West Bromwich, as sales manager of the company's Salterpak division. Outside sales representation of the division is by Mr. G. SANDERS and Mr. F. BLINCOE.

Mr. N. CAPSTICKS resigned on June 30 as local director and commercial manager, forgings, of Thos. Firth & John Brown, Limited. Mr. Capsticks, who has been with the company for over 43 years, resigned owing to ill-health.

Mr. NORMAN H. BACON, superintendent of the Ickles works of Steel, Peech & Tozer, Limited, Rotherham, retired on June 27, after 47 years' service with the firm. Mr. DONALD CRAIG, superintendent of the ingot department, retired on the same day after 28 years' service. Mr. Bacon is succeeded by Mr. R. Scholey.

Mr. J. L. HARVEY, a director of Laporte Industries, Limited, has been elected chairman of its subsidiary, the Fullers' Earth Union. He succeeds Mr. L. P. O'BRIEN, who has retired from the board of the subsidiary. Mr. O'Brien remains chairman of Laporte Industries, Limited.

Mr. W. M. LACON has been appointed registrar of Imperial Chemical Industries, Limited, from July 1. He succeeds Mr. R. E. MORRIS, who is retiring after more than 47 years with the company and its predecessors. Mr. Lacon joined ICI in 1927 and became assistant registrar in 1956.

Sir MARK NORMAN has been appointed secretary of Bristol Siddeley Engines, Limited, the new company formed jointly by Bristol Aero-Engines and Armstrong Siddeley Motors, Limited. Bristol Siddeley Engines has opened a London headquarters at Ormonde House, 26-27, St. James's Street, London, S.W.1.

Mr. FRANK H. BENNETT has resigned from the board of Triplex Foundry, Limited. Mr. CYRIL F. HOLLYHEAD, joint managing director of its subsidiary, Great Bridge Foundry Company, Limited, and Mr. ROBERT A. BARRETT, group accountant, have been appointed directors of the parent company.

Two employees of the Park Gate Iron & Steel Company, Limited, Rotherham, received presentations when they retired on June 23. They were Mr. HARRY POWELL, technical representative, and Mr. HERBERT FELTON, foundry foreman. Mr. Powell had been with the company since 1904 and Mr. Felton has completed 49 years' service.

Mr. JOHN HARDSTAFF, who held the position of maintenance engineering foreman, at G. C. Ogle & Sons (Retail), Limited, agricultural engineers of Ripley, has retired after 60 years' service with the firm. At one time he was foreman of the fitting shop and blacksmiths. At the annual dinner of the firm, Mr. J. Ogle, managing director, presented Mr. Hardstaff with a cheque from the directors for £600.

Mr. HENRY GARDNER was the principal guest at a banquet in Turnberry Hotel last week of the directors of Glenfield & Kennedy (Holdings), Limited, Kilmarnock, Ayrshire. He was presented with an oak corner-cabinet to mark his 50 years' service with the firm. Later, from Glenfield & Kennedy, Limited, he was presented with a rock garden and waterfall laid out at his home at Danepark.

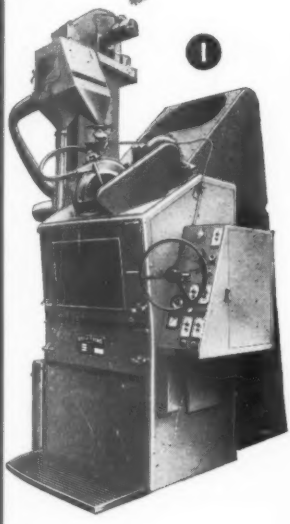
Mr. A. E. ROSE, a director of British Appliances Manufacturing Company, Limited, Long Close Works, Dolly Lane, Leeds, and president of the Leeds branch of the Institute of Welding, has been elected president of Leeds Rotary Club. He took office on July 1. Until he became a vice-president of the Rotary Club a year ago, he was chairman of the International Services Committee and took a prominent part in organizing excursions for overseas students in Leeds.

Mr. T. H. R. PERKINS, a director and general manager of the sales division of the Peterborough diesel engine firm of F. Perkins, Limited, and Mr. E. W. MARVILL, general manager of the company's manufacturing division, recently gave recorded interviews to the BBC Overseas Service feature "Everybody's Business." Mr. Perkins spoke of the growth of the works since the company was established in 1932 and said the company was now the world's biggest producer of lightweight diesel engines.

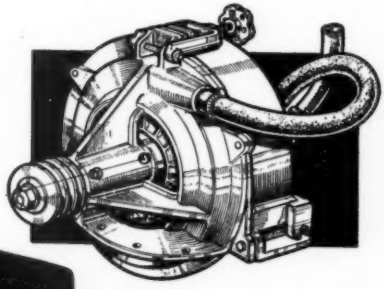
R. & A. Main, Limited, announce the appointment of Mr. JACK WORTLEY, B.SC., to the board of the company as works director. Mr. Wortley graduated from Glasgow University with first class honours as B.SC. in mechanical engineering in 1940, having undergone most of his practical training with Lever Brothers, Limited, at Port Sunlight. Joining R. & A. Main, Limited, at their Falkirk works in 1948, Mr. Wortley was in 1952 appointed general manager of R. & A. Main, Limited, Edmonton, and in 1956 became responsible for both the Falkirk and the Edmonton works of the company. He became a director of the Main Enamel Manufacturing Company, Limited, in 1955.

By mutual agreement Sir FRANK SPENCER SPRIGGS, who is 63, has relinquished the managing directorship of the Hawker Siddeley Group, Limited, an appointment he has held for the past 23 years. Sir Frank began his career in 1913 as an office boy with the Sopwith Aviation Company, Limited. He is chairman of A. V. Roe & Company, Limited, director of the Brush Group, Limited, chairman of High Duty Alloys, Limited, chairman of Armstrong Siddeley Motors, Limited, and the Gear Investment Trust, Limited, and is associated with a number of companies in the sphere of aviation. He has been succeeded by Sir ROY DOBSON, a director of the Hawker Siddeley Group, managing director of A. V. Roe and chairman of A. V. Roe (Canada), Limited, deputy chairman of the Brush Group, Limited, chairman of the Hawker Siddeley, John Brown Nuclear Construction Company, Limited, and the Hawker Siddeley Nuclear Power Company, Limited, and a director of High Duty Alloys and of the Kelvin Construction Company, Limited.

Shot Blast Equipment

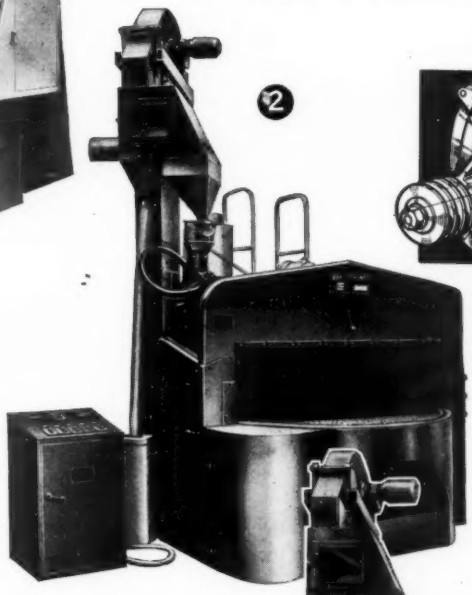


This A-S-L Turbine is the most modern Shot Blasting Unit available. The bi-phase air injection system enables shot to be projected at greater speeds using lower power with fewer replacements. The economies effected in spare parts alone are very substantial.



Baker Perkins High Speed Bi-Phase A-S-L Turbine, British Patent, No. 510681.

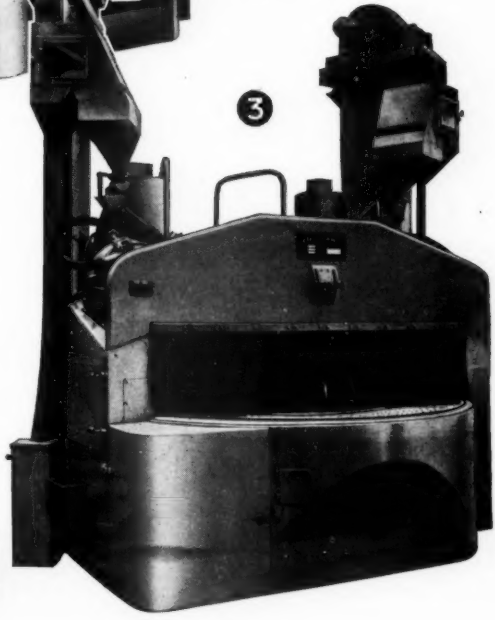
These machines do not require pits or special foundations.



1 ROTARY BARREL

2 CADET

3 MEDIUM



Our standard range of Rotating Barrel and Table Shot Blast Machines is capable of handling a wide range of Foundry products. Both types are semi-automatic, the rotating barrels being equipped with skip hoist loading gear and frontal discharge mechanism. These modern highly efficient machines are in use in Foundries all over the world, and are built to the high standards of design, materials and workmanship characteristic of all Baker Perkins' machines.

BAKER PERKINS LIMITED
ENGINEERS
WESTWOOD WORKS · PETERBOROUGH

Imports and Exports of Iron and Steel in May

The following tables, based on Board of Trade returns, gives figures of imports and exports of iron and steel in May. Totals for the first five months of this year and last are also included.

Total Exports of Iron and Steel

Destination.	Month ended May 31.	Five months ended May 31.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Channel Islands	312	1,707	1,919
Cyprus	555	4,741	2,988
Sierra Leone	1,946	5,099	5,544
Ghana	1,025	8,709	6,449
Nigeria	4,020	23,877	25,755
Union of South Africa	10,661	46,562	49,039
Rhodesia and Nyasaland	3,070	28,905	19,433
Tanganyika	1,508	9,905	5,915
Kenya	5,722	23,246	22,558
Uganda	121	1,849	1,346
Mauritius	185	1,565	1,937
Aden	74	2,364	1,591
Bahrein Qatar, and Trucial States	1,247	6,283	4,177
Kuwait	2,395	13,318	19,758
India	15,830	131,600	59,336
Pakistan	4,600	24,308	36,140
Singapore	3,283	18,254	15,648
Malaya	1,161	17,035	7,092
Ceylon	2,548	12,720	14,603
British North Borneo	341	1,786	1,220
Hongkong	6,921	43,300	23,349
Australia	8,204	89,563	36,633
New Zealand	16,911	80,312	78,689
Canada	15,802	119,160	81,108
Jamaica	1,353	10,650	8,597
Trinidad	3,239	19,571	23,273
British Guiana	935	3,121	3,496
Other Commonwealth countries	2,713	14,155	14,759
Eire	5,674	19,254	22,987
Finland	3,817	40,670	20,577
Sweden	12,965	48,754	63,781
Norway	12,108	50,506	43,873
Denmark	7,835	50,585	41,284
Western Germany	5,065	6,158	10,926
Netherlands	8,366	48,559	34,103
Belgium	2,144	17,827	10,956
France	217	8,196	1,380
Switzerland	533	8,223	4,801
Portugal	995	9,004	6,602
Spain	8,513	18,279	24,532
Italy	5,294	21,070	20,819
Austria	937	1,819	5,534
Yugoslavia	397	4,105	2,263
Greece	1,406	4,113	7,086
Turkey	659	2,978	2,437
Netherlands Antilles	205	1,686	787
Portuguese East Africa	250	2,007	1,144
Egypt	549	469	9,765
Sudan	4,038	8,009	18,117
Lebanon	122	1,409	8,034
Israel	272	1,799	3,524
Saudi Arabia	607	2,423	3,050
Iraq	6,230	16,698	16,897
Iran	3,863	27,997	13,730
Burma	921	8,436	4,281
Thailand	485	3,877	3,191
Indonesia	200	3,109	1,227
Philippine Republic	921	720	1,580
USA	6,714	21,580	32,755
Cuba	475	3,348	2,676
Colombia	361	2,039	3,472
Venezuela	5,593	45,674	42,862
Ecuador	410	1,249	1,683
Peru	800	5,524	5,716
Uruguay	163	3,450	602
Argentina	14,241	35,932	64,366
Other foreign countries	14,010	60,288	55,873
TOTAL	255,037	1,381,488	1,191,625

Total Imports of Iron and Steel

From	Month ended May 31.	Five months ended May 31.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Rhodesia and Nyasaland	979	2,002	3,166
Canada	2,914	23,034	8,840
Other Commonwealth countries and Eire	1,995	10,746	9,588
Soviet Union	4,870	108,390	62,593
Sweden	3,096	14,460	15,064
Norway	5,702	54,863	33,713
Poland	—	6,272	15
Western Germany	5,739	47,676	41,182
Netherlands	12,320	21,777	59,661
Belgium	4,444	72,547	38,980
Luxembourg	264	14,906	3,961
France	1,086	29,526	10,289
Italy	164	1,029	2,234
Austria	305	34,837	1,974
Japan	147	6,588	1,274
USA	15,554	78,396	103,323
Other foreign countries	475	14,017	2,467
TOTAL	60,064	541,006	398,324
Iron and steel scrap and waste, fit only for the recovery of metal	4,085	326,934	49,921

Exports of Iron and Steel, by Products

Product.	Month ended May 31.	Five months ended May 31.	
	1958.	1957.	1958.
	Tons.	Tons.	Tons.
Pig-iron	18,130	66,264	49,277
Ferro-columbium (niobium)	—	66	17
Ferro-tungsten	88	322	235
Other ferro-alloys	144	1,442	1,259
Ingots, blooms, billets, slabs, sheets, and tinplate bars	2,069	573	4,895
Iron bars, rods, angles, shapes, and sections	125	916	645
Steel bars, rods, angles, sections, and shapes	33,563	224,040	160,821
Iron plates and sheets	19	80	1,812
Universal plates	1,249	3,237	2,850
Steel plates, ¼ in. and under ⅜ in.	481	4,719	3,289
Ditto, ⅜ in. and over	19,727	87,955	90,513
Blacksheets and blackplate	24,604	146,477	133,694
Hoop and strip	4,282	41,918	25,941
Tinplate	35,893	179,639	150,133
Decorated tinplate	327	2,043	1,228
Galvanized sheets	8,127	88,835	30,909
Other (incl. tinned sheets, terneplate and ternesheets)	1,063	9,578	6,002
Railway and tramway construction material	24,255	114,415	107,334
Wire rods of steel (incl. alloy steel)*	3,843	22,375	16,788
Wire	9,320	47,509	34,455
Tubes, pipes, and fittings	65,160	333,326	350,752
Iron castings	1,779	821	3,758
Steel castings	275	1,467	1,388
Forgings	514	3,471	3,630
TOTAL	255,037	1,381,488	1,191,625

* The figures for 1958 are not completely comparable with those for previous years.

AN AMSTERDAM report states that prices of steel products in Holland have been reduced by between 1.4 and 6.9 per cent.

FROM JULY 7, under the National Health Service Contributions Act, 1958, the weekly contribution for the National Health Service is increased by 6d. for men, 4d. for women, and 2d. for juveniles, with an additional 2d. from the employer in the case of employed persons.

CONVEYOR PROBLEMS?

Then get Goodyear, the world's most economical, most widely used belts

Whatever materials you convey there is a Goodyear Conveyor Belt that is made to do the job– at the lowest cost per ton. These are the features essential for dependable, long life belt service– the features you get when you buy Goodyear.

1. **PROPER TROUGHING** that ensures correct idler contact.
2. **MILDEW-INHIBITED** construction prevents mildew rot that can ruin belts.
3. **LONGEST COVER LIFE** that comes from use of tough, highest quality covers that ensure maximum resistance to abrasion and stripping.
4. **HIGH FLEX-LIFE**–greater flex-life because of skim coating between plies with highest quality friction rubber.

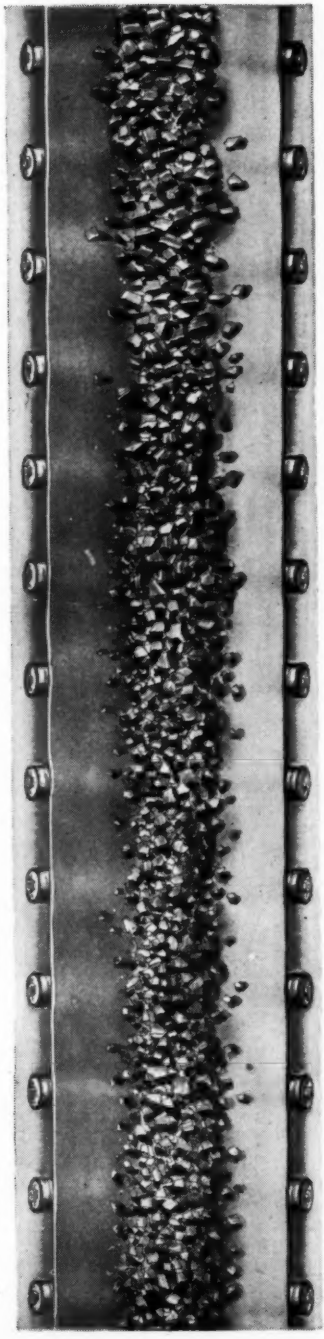
Remember that Goodyear technicians are always available to ensure that you get the right belt for the job and will advise on installation and maintenance.

Write now for further information to the Goodyear Tyre & Rubber Company (G.B.) Ltd., Industrial Rubber Division, Wolverhampton.

GOODYEAR

INDUSTRIAL RUBBER PRODUCTS

CONVEYOR BELTING · TRANSMISSION BELTING · V-BELTS · FENDERS · HOSE



Raw Material Markets

Iron and Steel

Plentiful supplies of raw materials are available for the ironfoundries, outputs of pig-iron being in excess of usage. Many of the blast furnaces are not producing to capacity and some units have been closed down temporarily so that supplies are more than adequate for present requirements. The steelworks continue to absorb large tonnages of basic pig-iron for both consumption and stock, but their demands are on a reduced scale on account of the lesser demand for steel.

In the foundry grades of pig-iron, many producers are unable to dispose fully of their outputs, resulting in increased handling charges for stocking. The low-phosphorus irons continue in biggest demand for the engineering and speciality foundries in the production of high-duty castings. However, with the increased outputs now being obtained, coupled with a decline in demand, these irons are now plentiful. Castings for the motor vehicle trade are still in fairly heavy demand, but many of the foundries supplying them are still working below earlier levels.

The machine-tool industry and also the heavy engineering trades are not specifying for castings at previous levels, although overall demands keep the engineering and speciality foundries employed much more favourably than other units. They also continue to take up fairly good tonnages of hematite pig-iron and some refined irons, but in both these grades supply exceeds demand. There is only a moderate call for the high-phosphorus grades of pig-iron and the light, jobbing, and textile foundries on whom the furnaces principally rely for their business are in the main very quiet. The furnaces find it necessary to place a large proportion of their outputs into stock, as orders are scarce.

In all grades of pig-iron, producers can undertake business for the export market, but orders are scarce due to the low prices offered by makers abroad. The foundries generally are keeping stocks at minimum levels and forward buying is negligible. In cases of urgency they rely on the furnaces to meet their requirements from stock.

The trading position at the re-rollers remains unchanged, most units being on short time with little hope of an improvement in the near future. Demands for sections and bars are at a low level and difficulty is experienced in obtaining sufficient orders to make up rolling programmes for the shortened working week. Reinforcing rods and strip are in fair demand, but orders continue scarce for steel semis, and home steelworks could meet a much larger demand for billets, etc. There is little call for defectives and crops which arise at the steelworks.

Non-ferrous Metals

The United States Senate's Interior Committee, which has been discussing ways and means to help domestic producers of non-ferrous metals, unanimously approved a programme of long-range price supports for lead and zinc, tungsten, and acid grade fluorspar. At the same time it rejected the proposal to stockpile lead, zinc, and aluminium, and withheld its approval of price supports for cobalt, mercury, antimony, and metallurgical grade fluorspar. On the other hand, it accepted the proposal to stockpile 150,000 tons of copper at prices up to 27½ cents a pound, equivalent to £220 a ton, for one year provided the metal was mined by US producers. An important feature of the committee's deliberations is that the approval has been given in such a way as to abolish the need to seek annual appropriations for these support programmes by providing the Interior Department with the authority to borrow $350,000,000.

When the stockpiling programme for copper will come into operation is not yet known. Nevertheless, the implications of the move are clear and will be a bullish factor in the outlook. However, Congress has not taken any action with regard to the import duty of 1.7 cents a pound and this was automatically imposed on July 1. There is a growing disposition to believe that the import duty will only be a temporary stop-gap measure and will be repealed when the stockpiling programme starts.

Meanwhile, custom smelters are maintaining their price at 25½ cents a pound, at which level buying is slow, most probably due to the confused position prevailing. Producers are still split on their quotation with Anaconda, offering the metal at 26½ cents and Phelps-Dodge and Kennecott selling at 25 cents a pound. The fact that the producers did not all come into line at the higher level is, of course, interpreted bearishly. The scrap market continues busy and US consumption in April showed a 12 per cent. rise over March. The price is now 21 cents after being up to 21½ cents a pound.

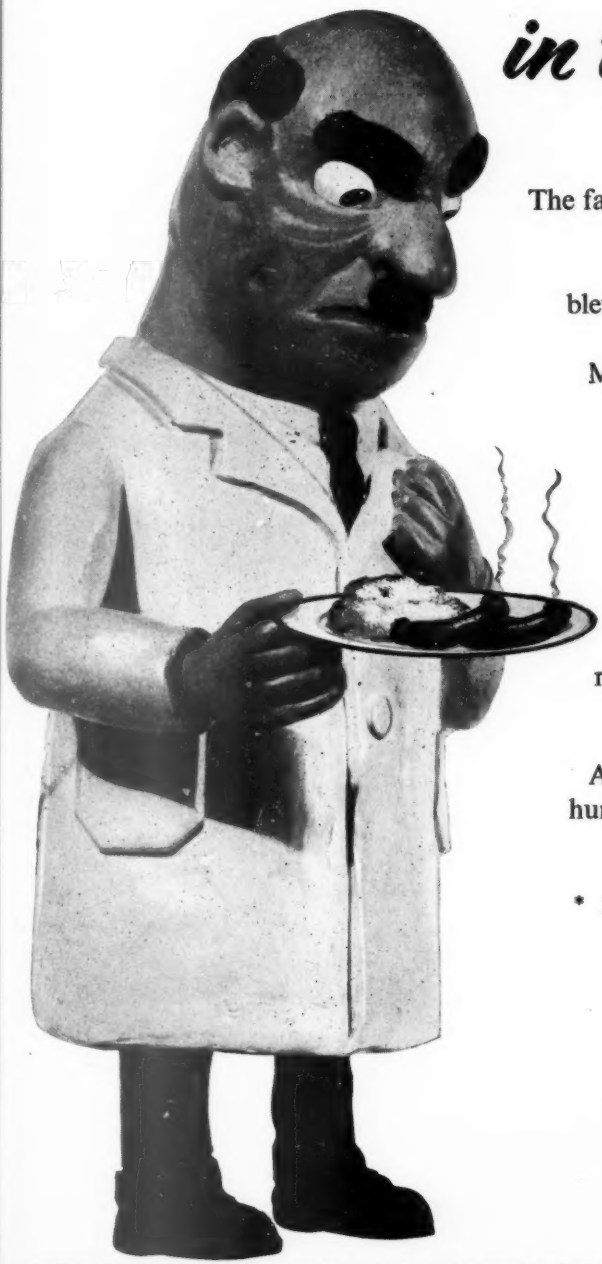
In London the price has ranged as much as £15 a ton over the last two weeks, the high being £207 10s. and the low recorded at £192 10s. a ton. Despite the large drop experienced it is worth noting that buying increased as the price fell, so that once it had reached the low figure of £192 10s., the Continent came in to swell demand and the price recovered to around the £200 a ton mark. But demand was not the only consideration moving the price higher. Unsettled labour relations in Chile were an important factor and the fact that no settlement at the El Teniente mine had been effected after long weeks of negotiations over wages was a favourable factor. On Monday of this week, however, a solution was agreed upon and this, allied to the imposition of the copper tariff, weakened the market and the price for both cash and forward metal sank to around £197 a ton. Stocks at the end of last week declined further and totalled 13,757 tons.

Tin is still a sticky market with the prices moving narrowly. Whether or not Russia will join the International Tin Council is the major factor holding up the emergence of any clear trend in this market. The London market is quiet, as it is in the United States where the price is hovering around 94½ cents a pound.

Lead, which has been subjected to a variety of proposals for its support in the US, seems now to have been saddled with a support programme under which the Interior Department will have the authority to subsidize US producers on the basis of the differential existing between the market price and 15½ cents a pound with the maximum subsidy being 4 cents per pound on a total of 350,000 tons. At present the price is 11½ cents a pound at which level demand has fallen away and the quotation is now vulnerable. The rejection of stockpiling was not favourably received in London and the cash price dropped over two points.

Zinc is a relatively firm market on both sides of the Atlantic. The major influences have been the expected support programme and also the latest cut-back in production announced by American Smelting & Refining, which will reduce its output of zinc by a further 500 tons a month. The reduction came into effect on Tuesday. The support programme as approved by the Interior Committee involves the subsidizing of producers as to the differential between the market price and 13½ cents a pound for a total of 550,000 tons. The maximum subsidy has been fixed at 3 cents a pound.

The Biggest Binder in the Business



The fat was in the fire the other lunch-time. Just as our Oldest Hand arrived, a great cloud of smoke blew out of the serving hatch. Fond though he is of our Canteen Manageress, the Old Boy couldn't resist the observation:

"You'd get much less obnoxious fumes if you used our Sternocore binders* in those bangers, love!"

"That," she said, "is a bright remark—coming from the biggest binder in the works!"

At which our Oldest Hand retired hurt, to brood over his two charred sausages and mash.

* *They would impress you with their higher permeability and lower true cost.*

Sternol
STERNOCORE
PRODUCTS

STERNOL LIMITED, ROYAL LONDON HOUSE, FINSBURY SQUARE, LONDON, E.C.2. Tel.: MONarch 3871-5

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

July 2, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £47 0s. 0d. to £47 10s. 0d., scale 17s. 0d. per unit; 75 per cent. Si, £66 0s. 0d. to £66 10s. 0d., scale 17s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 7s. 2d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 10s. 2d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £91 10s. 0d., basis 60 per cent. Cr, scale 30s. 0d. to 30s. 6d., per unit; over 6 per cent. C, £87 10s. 0d., basis 60 per cent. Cr, scale 30s. 6d. per unit; 2 per cent. C,* 2s. 0d. per lb. Cr; 1 per cent. C,* 2s. 0½d. per lb. Cr; 0.15 per cent. C,* 2s. 1½d. per lb. Cr; 0.10 per cent. C,* 2s. 1¾d. per lb. Cr; 0.06 per cent. C,* 2s. 2d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £265 0s. 0d.; 96/98 per cent., £295 0s. 0d.

Ferro-columbium.—65/72 per cent., Nb + Ta, 19s. 9d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £83 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t. £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s., 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats, 5 in. wide and under, untested soft basic, 50 tons and over: £40 0s. 6d; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g. £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s 6d. galvanized corrugated sheets, 24g., £66 16s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £195 0s. 0d. to £195 5s. 0d.; three months, £196 0s. 0d. to £196 5s. 0d.; settlement, £195 5s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 1s. 11½d. per lb.; rods, 227s 0d. per cwt. basis; 20 s.w.g., 260s. 3d. per cwt.

Tin.—Cash, £730 0s. 0d. to £730 10s. 0d.; three months, £730 10s. 0d. to £731 0s. 0d.; settlement, £730 10s. 0d.

Lead (Refined Pig).—First half July, £72 5s. 0d. to £72 15s. 0d.; first half October, £73 5s. 0d. to £73 7s. 6d.

Zinc.—First half July, £63 0s. 0d. to £63 2s. 6d.; first half October, £63 10s. 0d. to £63 12s. 6d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £98 0s. 0d.; rolled zinc (boiler plates), all English destinations, £95 15s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £87 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 6¾d. per lb. sheets to 10 w.g., 169s. 0d. per cwt.; wire, 2s. 4½d.; rolled metal, 169s. 0d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £138; B6 (85/15), £175; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £170; HTB2 (38 tons), — ; HTB3 (48 tons), — .

Gunmetal.—BS1400, LG2 (85/5/5/5), £167; LG3 (86/7/5/2), £177; G1 (88/10/2/½), £236; (88/10/2/1), £225.

Phosphor Bronze.—BS1400, PB1 (AID released), £250 per ton.

Phosphor Bronze Strip, etc.—Strip, 251s. 6d. per cwt.; wire, 3s. 8¼d. per lb.; rods, 3s. 0d.; tubes, 3s. 0d.; chill cast bars: solids 2s. 11½d.; cored 3s. 0½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 6½d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 11d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 10d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £76 0s. 0d. Nickel, £800 0s. 0d. Aluminium ingots, £190 0s. 0d.; aluminium bronze (BS1400), AB1, £200; AB2, £213.

* Average 68-70 per cent.